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Contents

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

Volume 30 of the Bulletin of the California Lichen Society was issued on Apr 10, 2024.
Cover image: Founders and guests of the California Lichen Society in 1994 , meeting for the first time at the Doell's cabin in the Santa Cruz Mountains. From left to right: Richard Doell, guest Nancy Brewer, Darrell Wright, Janet Doell, Barbara Lachelt, Doris Baltzo, guest Ellen Thiers, Harry Thiers, Mona Bourell, Bill Hill, Charis Bratt, and guest Peter Bratt.

Key to genus for the macrolichens of central coastal California

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"Central coastal" in this key means the areas of central California counties (Mendocino, Sonoma, Marin, San Francisco, San Mateo, Santa Cruz and Monterey) that are subject to the direct influence of the maritime climate. Included are parts of the counties surrounding San Francisco Bay (Napa, Solano, Contra Costa, Alameda, and Santa Clara) that are not on the immediate Pacific edge, but are still strongly influenced by the marine climate. It draws on numerous sources, most especially personal experience; some of the most helpful general resources for the central coast region of California are listed at the end of the keys.

Anyone attempting to identify lichens using this key should bear in mind that it is a work in progress, and that even the newest taxonomy, some of which is included here, is subject to change. This key is by no means comprehensive; and as a result, you may have in your hand a lichen that does not key out. If your lichen does key out, but the name you reach is not familiar, a valuable free resource for tracking nomenclatural changes is *A Cumulative Checklist for the Lichen-forming, Lichenicolous and Allied Fungi of the Continental United States and Canada*, maintained by Dr. Theodore Esslinger at the University of North Dakota and Dr. James C. Lendemer at the New York Botanic Garden, and available here: (https://www.ndsu.edu/pubweb/~esslinge/chcklst/chcklst7.htm). This list is updated approximately every two years or so.

Please also keep in mind a couple questions useful to anyone looking at a new lichen for the first time, or even those who are more experienced: Is it a lichen? Is it one lichen, or a mixed collection? Is it a healthy lichen, with well-developed characters? Or is it discolored, with patches of blackened or broken tissue?

The colors in the key refer to the color of the *dry* lichen. Abbreviations used in the key are explained at the end.

Key to groups

1a) Fruiting body mushroom- or club-shaped, not persisting beyond a season, with a green algal mat on the surrounding substrate **basidiolichens** (not covered in this key)
1b) Fruiting body not mushroom or club-shaped; foliose, fruticose, umbilicate, gelatinous or squamulose 2
2a) Thallus interior homogenous, dark, without internal layering (unstratified); thallus gray to brown to black, rubbery when wet; photobiont a cyanobacterium **gelatinous lichens**
2b) Thallus interior stratified, cut edge showing stratified layers (concentric layers in fruticose thalli); thallus colors various, thallus sometimes too dark or thin to see strata 3
3a) Thallus lower surface not different from upper; thallus fruticose, tufted like the branches of a bush, or fine and hair-like, pendant or erect, or having erect stalks and growing on the ground; sometimes <10mm tall **fruticose lichens**
3b) Thallus lower surface differing from upper; thallus foliose, usually flat, thin, leaf-like (but sometimes minute, bead- or scale-like, with lobes nearly as thick as they are wide or long) 4
4a) Thallus attached to the substrate at a single central point; usually on rock **umbilicate lichens**
4b) Thallus attached by rhizines, hairs or directly to the substrate 5
5a) Cut edge showing (among other layers) a dark blue-green or black layer **stratified foliose cyanobacterial lichens**
5b) Cut edge showing a grass-green layer **stratified foliose green algal lichens** (includes squamulose)

Gelatinous lichens (unstratified, rubbery when wet, with cyanobacterial photopartner)

1a Thallus foliose; cellular cortex present or not (LM) 2

2a Lower surface white tomentose (tomentum often not visible when wet) 3

3a Lobe margins, upper surface, isidia and/or apothecia with fine hyaline hairs, lobes dark gray to almost black; thallus barely stratified (hand lens); on moss on rock ***Leptochidium albociliatum***

3b Fine hyaline hairs lacking; color light gray to almost black; cellular cortex present in thin section (LM) ***Leptogium*** [1]

2b Lower surface without hairs (glabrous) 4

4a Thallus black; lobes rounded to strap-like, upper surface with granules (hand lens); cellular cortex absent (LM); on soil and rocks ***Lichinella***

4b Thallus brown to dark brown or black, or with distinctly brown to amber-colored areas; on rock or bark, or moss over rock or bark 5

5a Cellular cortex (LM) absent; thallus with distinctly brown to amber-colored areas, lobes strongly ridged and blistered; common species with isidia or apothecia; on bark ***Collema*** [1]

5b Cellular cortex present; thallus uniform in color, medium gray to brown to black; on various substrates ***Scytinium (Leptogium)*** [1]

1b Thallus fruticose, or apparently so; cellular cortex present 6

6a Thallus truly fruticose; branches cylindrical, <0.2mm diameter; apothecia usually present, with a dark red-brown disk and a thick persistent margin; spores 2-celled ***Polychidium muscicola***

6b Thallus with at least some lobes flattened; spores with >2 cells 7

7a Thallus brown; lobes ascending, lobe tips curled into tubes; tufts of hairs absent to sometimes quite dense on lower surface in drier climates ***Scytinium palmatun***

7b Thallus minutely fruticose, but with broad expanded lobes beneath ***Scytinium (Leptogium)***

Fruticose lichens (bushy, branched, hair-like, or with stalks; lower surface not different from upper)

1a Thallus or parts of thallus orange, yellow, yellow-orange or fluorescent chartreuse 2

2a Thallus fluorescent chartreuse, tufted or subpendant; branches contorted, bumpy or smooth; with or without brown apothecia that have a thalline margin ***Letharia***

2b Thallus orange to yellow-orange 3

3a Thallus orange to yellow-orange, small, <30mm diameter, crustose or nearly so; branches minute, 0.2–0.5mm diameter, ascending, usually <10mm tall 4

4a On seacoast rocks in the salt spray zone ***Polycauliona coralloides***

4b On bark, wood, or rock; branches slightly flattened; soredia present on one surface ***Polycauliona (Xanthoria)***

3b Thallus orange, 2-7cm diameter, erect, clearly not crustose, attached at a single point; branches thicker than above; on bark (rarely rock) ***Teloschistes***

1b Thallus white, gray, brownish-gray, or light to dark brown to almost black, or pale green to yellow-green 5

5a Thallus gray-brown to brown or reddish-brown, to dark brown or black 6

6a Thallus small to minute, gray-brown to brown to black, sometimes cushion-forming, <5cm tall; branches typically <0.4mm diameter; photobiont a cyanobacterium 7

7a Thallus usually <10mm diameter; with brown branches radiating from a main trunk that is pale or white and <0.3mm thick; apothecia absent; on wood or bark "***Dendriscocaulon***"

7b Thallus up to 3cm diameter, black or nearly so throughout; on bark or rock, or moss over bark or rock; apothecia present or not 8

8a Thallus composed of fine erect densely packed forked blackish branches radiating out from the base and forming a cushion or turf; apothecia often with a thick rim that is reddish or orangish-red; spores muriform (LM) ***Scytinium*** [1]

8b Thallus richly branched, dark brown, 2–5cm tall; branches very thin, <0.2mm diameter; apothecia common, brown; spores 2–celled (LM); on moss over rock, occasionally moss over bark ***Polychidium muscicola***

6b Thallus larger, 2.5–20cm long; branches of various diameters; photobiont a green alga 9

9a Thallus tufted, with an generally spiny appearance; rarely pendulous 10

10a Thallus black or greenish black; branches <3cm long, up to 3mm wide, flattened, tips finely dissected; apothecia common; soredia and isidia absent ***Kaernefeltia***

1 The genera in the family Collemataceae were recently revised (Otalora et al. 2014), resulting in ten genera instead of two. This has a large impact on jelly lichens in California, and this key is only an approximation to guide you to the groups (*Leptogium* and *Collema*) as they existed under the older names.

10b Thallus distinctly reddish-brown; apothecia present in one species (*N. abbreviata*); pseudocyphellae absent; cortical cells interlocking like the pieces of a jigsaw puzzle (LM) ***Nodobryoria***

9b Thallus filamentous, sometimes very fine, frequently pendulous; branches 2–40cm long , round or angular but not flattened; soredia sometimes present 11

11a Thallus pale brown or greenish brown or nearly black, not reddish; pseudocyphellae present and often minute but sometimes longer; soredia present in some species; chemistry with at least one spot test having a red or pink reaction ***Bryoria***

11b Thallus brown or chestnut brown, never greenish, some branches paler, giving the appearance of a mixed collection with *Alectoria*; branches with a strong coiling twist, or with prominent longitudinal grooves that coil around the branch, most noticeable at branch junctions; cortex K+Y, C-, KC+Y, P+Y ***Sulcaria***

5b Thallus another color: white, gray-white, brownish-white, brownish-orange, or green or yellow-green 12

12a Branches or stalks (podetia) not hollow 13

13a Thallus pale green, <5cm, pendant with age; branches becoming whitish, sometimes tapering towards the tips, sometimes with bands of black pycnidia; distinctive blue-gray soredia present in oval soralia; on bark; coastal ***Niebla cephalota***

13b Thallus yellow-green or greenish-yellow, or some shade of white or gray 14

14a Thallus yellow-green or greenish yellow 15

15a On bark or wood 16

16a Branches flattened 17

17a Thallus matte, soft; branches flattened, appearing fruticose but lower surface slightly paler; soredia present on branch margins and upper surface ***Evernia prunastri***

17b Thallus often shiny, stiff; branches minutely hairy in one fertile (having apothecia) species (*R. puberulenta*), and forming lacy nets in another (*R. menziesii*); apothecia or soredia present or absent; soredia sometimes developing *inside* the branches, or along branch margins, or at the branch tips, or on flaps at the tips of the branches ***Ramalina***

16b Branches round or angular in cross-section 18

18a Main branches containing an elastic central cord that can be exposed by the pull test (gently pulling apart a single strand until the cortex cracks, revealing the central cord); thallus yellow-green, usually richly branched, tufted to pendant, with papillae, tubercles, fibrils, isidia, soredia, and/or apothecia ***Usnea***

18b Elastic central cord absent, or apparently absent; cortex not cracking during the pull test 19

19a Thallus branches very long, to several meters, and largely unbranched, densely fibrillose; main axis very thick with sometimes a thin cortex; pale green or with a slight yellow tings ***Usnea longissima***

19b Thallus tufted to pendant, branches <80cm long, moderately branched; main branches ridged, angular in cross-section, with prominent pale raised short pseudocyphellae; sometimes with numerous short spinules ***Alectoria***

15b On rock 20

20a Thallus erect, growing from a central holdfast, <12cm tall; coastal but up to 16km inland where coastal fog makes inroads; branches elongate, flattened or round, with a network of pale reticulate cracks; apothecia often present; pycnidia present, appearing as small black dots on the branch margins; on coastal rocks ***Niebla***

20b Thallus with short branches, <20mm tall; hypercoastal 21

21a Thallus cushion-forming, of short finger-like intricately divided roughened branches <20mm tall; apothecia lateral, usually present, small, pruinose, with a margin colored like the thallus; on coastal rocks and soil; cortex K+Y, C+O-R, KC+Y-O; California ***Lecanora phryganitis***

21b Thallus of short blunt branched stalks <10mm tall; stalks tough like cartilage, thickly pruinose (but not eroding into granules); apothecia terminal, pink, with white pruina and margin colored like the thallus; on coastal rocks; cortex K+Y, C-, KC+Y, P- ***Cladidium bolanderi***

14b Thallus some shade of white (white, cream, gray), but sunburnt individuals may be present; check thalli in less exposed locations, if possible 22

22a Thallus of unbranched or sparingly branched stalks, closely massed or discretely separated, <5cm tall 23

23a Stalks crowded, unbranched or sparingly branched, minute (stalks are actually elongate isidia), cylindrical, <0.2mm diameter and <2mm high; on bark ***Loxosporopsis corallifera***

23b Stalks discrete, roughened or bumpy, <5cm tall, tipped with black spherical apothecia; crustose basal thallus with cephalodia present; on rock ***Pilophorus acicularis***

22b Thallus branched or richly branched, tufted or more-or-less filamentous; branches <12cm tall 24

24a Thallus tufted or erect, <7cm tall 25

25a On bark. Thallus cream or white to green but orange to brown in exposed locations, richly branched; main branches <8cm long; side branches cylindrical, fragile; apothecium a terminal mazaedium (spores in a loose spherical mass and leaving a black mark on the finger when touched) ***Sphaerophorus***

25b On rock or soil on rock. Branches forming a dense close-packed thallus; branches covered in squamulose or coralloid or granular outgrowths (phyllocladia); cephalodia present in most species; uncommon ***Stereocaulon***

24b Thallus elongate, pendulous, up to 9cm; hypercoastal on rocks and shrubs 26

26a Thallus white to pale gray or yellow-gray; branches flattened at the junctions, fragile, brittle, with small lateral bumps (side branches) frequent; cortex chemistry negative ***Dendrographa***

26b Thallus white to violet-gray, or pale brownish; branches round or flattened, 1–4mm wide, with abundant raised soralia containing coarse white or gray soredia; cortex K-, C+R, KC+R, P- ***Roccella***

12b Branches or stalks (podetia) hollow 27

27a Stalks pale white or off-white, 2–7cm long, not or slightly branched, not associated with a basal thallus; on soil, moss or rocks; “white worm” lichen ***Thamnolia vermicularis***

27b Stalks otherwise 28

28a Podetia short, <5mm tall; dull red-brown apothecia present at tops of podetia; basal thallus powdery-crustose, granular or squamulose; on soil or rocks ***Baeomyces rufus***

28b Podetia larger, pale with tips abruptly branched (section *Cladina*); or yellow-green to green-yellow, richly branched and bush-like, with pointed branch tips; or slightly branched to unbranched, with red or brown apothecia at the tips of the podetia; or podetia cup- or goblet-shaped; basal thallus squamulose, but sometimes disappearing. Growing with mosses or on the ground or the low branches/trunks of trees, or on wood ***Cladonia*** (includes subgenus *Cladina*)

Umbilicate lichens (foliose; attached to rock at a single central point)

1a Thallus small, <7mm; cut edge showing (among others) a dark blue-green layer; strongly marginal soredia present in one species (*P. euploca*) ***Peltula***

1b Thallus larger, upper surface pale gray, dark gray, brown to dark brown; cut edge showing a bright green layer 2

2a Perithecia (flask-shaped fruiting bodies) present (LM), embedded in the thallus, visible as small black dots on the upper surface ***Dermatocarpon***

2b Perithecia absent, apothecia present, the disk having a spiral pattern, or concentric furrows, or star-shaped, sometimes smooth ***Umbilicaria***

Stratified foliose cyanobacterial lichens (not umbilicate; cut edge showing a dark blue-green layer)

1a Thallus medium to large, generally >2cm; lower surface tomentose or cottony 2

2a Lower surface cottony, rhizinate; veins present, sharply defined and threadlike or broad, low and diffuse, sometimes obscure; lobes up to 6cm wide; upper surface some shade of gray or brown; soredia, tomentum pruina, or erect saddle-shaped apothecia present ***Peltigera***

2b Lower surface tomentose 3

3a Tomentum uninterrupted; lobes sometimes with a narrow hairless margin 4

4a Thallus gray to almost black; lobes <8mm wide; lobe margins, upper surface, isidia and/or apothecia with fine erect hyaline hairs (hand lens); thallus barely stratified (hand lens); tomentum white to brown; on moss on rock ***Leptochidium albociliatum***

4b Thallus brown to dark brown; lobes <10mm wide; kidney-shaped apothecia on the lower surface of the lobe tips; tomentum brown; one species (*N. laevigatum*)with an orange medulla ***Nephroma***

3b Tomentum interrupted with bald spots, papillae, cyphellae or pseudocyphellae 5

5a Tomentum interrupted by bald spots where the lower cortex is clearly visible; lobes <4cm wide; upper surface gray to brown, reticulately ridged; soralia dot-like, pustulate, or erupting on upper surface or linear along margins ***Lobaria***

5b Lower surface with papillae, cyphellae, or pseudocyphellae 6

6a Papillae present as small white bumps protruding through tomentum; apothecia on the lower surface of the lobe tips; thallus gray-brown to brown or dark brown; lobes <10mm wide ***Nephroma***

6b Papillae absent 7

7a Thallus medium-size, <6cm diameter; upper surface brown to dark brown or black, not ridged, with isidia or soredia; true cyphellae present as breaks in the lower cortex that have a strongly-defined rim and resemble craters ***Sticta***

7b Thallus medium to large, <18cm; upper surface brown, strongly reticulate-ridged, with soredia or apothecia; pseudocyphellae present as eroded rimless spots in the lower cortex where the medulla shows through 8

8a Medulla and/or soralia yellow ***Pseudocyphellaria***

8b Medulla white; apothecia, or soredia of another color (not yellow) present ***Lobaria***

1b Thallus smaller; lower surface not tomentose or thallus too tightly appressed to tell 9

9a Thallus minutely foliose, wide- or narrow-lobed, appressed to the substrate 10

10a Lobes elongate, thin and narrow, <0.4mm wide, fanning out at the tips; upper surface olive-green to yellow-brown, closely appressed; isidia, lobules or apothecia present; on rock ***Koerberia***

10 Lobes broad to rounded, thicker, <6mm wide, often pruinose; upper surface gray or blue-gray or brown; thallus usually atop a black basal layer of hyphae (hypothallus); apothecia reddish with a thalline margin; cortex and/or medulla P+O; on bark and moss on bark in humid coastal forests ***Pannaria***

9b Thallus squamulose, lobes very thick in proportion to their size, often arranged like shingles 11

11a Thallus of irregularly swollen lobes with immersed apothecia, broadly attached, or of flattened lobed or unlobed squamules that are attached at a single point (umbilicate); on rock in damp, wet places ***Peltula***

11b Squamules frequently with white or blue-white frosted tips (dissecting microscope); usually atop a black basal layer of hyphae that extends beyond the margins of the thallus (hypothallus); thallus P-; on rock, soil, bark and wood ***Fuscopannaria***[2]

Stratified foliose green algal lichens (not umbilicate; cut edge showing a bright green layer)

1a Lobes hollow; apothecia or soredia present; pycnidia almost always present ***Hypogymnia***

1b Lobes solid 2

2a Lower surface cottony, rhizinate; veins present, sharply defined and threadlike or broad, low and diffuse, sometimes obscure; lobes up to 6cm wide; upper surface green, with gray speckles; erect saddle-shaped apothecia sometimes present ***Peltigera***

2b Lower surface various, but not veined, not cottony 3

3a Lower surface tomentose, tomentum interrupted by numerous bald spots where the lower cortex is clearly visible; upper surface reticulately-ridged; lobes <4cm wide; thallus large, brown to olive brown, bright green when wet ***Lobaria***

3b Lower surface not as above 4

4a Thallus orange or yellow-orange, at least in part orange or yellow foliose

4b Upper surface white, gray, green, brown, olive brown or yellow-green to greenish-yellow 5

5a Upper surface yellow-green to greenish-yellow yellow-green foliose

5b Upper surface white, gray, green, brown, or olive brown 6

6a Thallus squamulose; on all substrates squamulose

6b Thallus foliose, commonly on bark 7

7a Lobes narrow, <1.5mm wide; thallus usually small narrow-lobed foliose

2 This large genus is difficult to characterize, individual species showing a complex of characters that defy easy identification as a unified group, even in as small an area as the central coast. The squamulose form, minute size and blue to gray to blue-gray coloration and the frosted tips are good general characters.

7b Lobes >1.5mm wide; thallus medium to large — broad-lobed foliose

Orange or yellow foliose

1a Thallus yellow; cortex K- — 2

2a Thallus minute, foliose, sometimes with a greenish cast, usually <10mm; lobes very small; soredia marginal and on lower surface — ***Candelaria***

2b Thallus small to medium, brilliant yellow; apothecia brown with thalline margin; on bark, especially in drier sites (*Pinus ponderosa* and old-growth manzanita) — ***Vulpicida canadensis***

1b Thallus orange or yellow-orange, cortex K+R or purple — 3

3a Thallus up to 8cm diameter, attached with hapters (short peg-like rhizines) to bark or wood; lobes appressed, <3mm; apothecia usually abundant — ***Xanthoria parietina***

3b Thallus smaller, rhizines present or not; apothecia present or not — 4

4a Well-developed rhizines usually present; thallus 10–32mm; lobes 0.6–2mm — ***Xanthomendoza***

4b Rhizines short or absent, hapters present or not; thallus <25mm; lobes <0.7mm — ***Polycauliona (Xanthoria)***

Yellow-green foliose

1a Thallus not appressed to the substrate, lobes flattened, appearing fruticose but lower surface slightly paler; lobes soft, matte; soredia present on margins and upper surface — ***Evernia prunastri***

1b Thallus loosely to tightly appressed to the substrate (bark, wood or rock) — 2

2a On rock; apothecia usually present, disk brown with a margin colored like the thallus; isidia present in at least two species — ***Xanthoparmelia***

2b On bark, wood, or rock — 3

3a Round to angular white pseudocyphellae present on upper lobe surface; soralia laminal to strongly marginal, often uplifted; lower surface brown at the edges, darker towards center; rhizines sparse or absent — ***Flavopunctelia***

3b Pseudocyphellae absent; soredia coarse, pustulate, resulting from the breakdown of the upper cortex; lower surface black except for a brown margin; rhizines black, abundant — ***Flavoparmelia caperata***

Squamulose

1a On bark, wood, or moss on bark or wood — 2

2a On new or old burned wood or bark; squamules shell-shaped, pale brown to brown with a paler edge, <1mm; medullary chemistry various — ***Carbonicola*** and ***Hypocenomyce***

2b On unburned bark, or moss on bark or wood — 3

3a Squamules small, 2-12mm, foliose, with a green to yellow-green corticate upper surface, and a clearly differentiated and easily viewed lower surface that is cottony and without a cortex; attached at one edge; on soil, bark, wood, or moss on bark or wood — ***Cladonia*** (squamules only)

3b Not as above; squamules minute; almost always on moss on bark, especially oaks — 4

4a Squamules <2.5mm, roughly ear-shaped, flattened, thin; gray-green or bluish green, with a narrow prominent margin that is the same color as the squamule; spherical soredia present along the margin or in the center of the squamules — ***Normandina pulchella***

4b Squamules minutely lobate, lobes approximately 1mm, poorly-shaped; green when fresh (and dry), brown after storage; soredia present, developing inside translucent white spherical soralia that burst open; apothecia present or absent — ***Waynea californica***

1b On terrestrial substrates: soil, rock, organic detritus, or moss on these substrates — 5

5a Perithecia (flask-shaped fruiting bodies) present (LM) embedded in the thallus, visible as small black dots on the upper surface — ***Endocarpon, Placidium*** and ***Placidiopsis***[3]

5b Apothecia present, disk-shaped with a lobulate margin colored like the thallus, or hemispherical with an inconspicuous margin, or apothecia absent — 6

6a Growing on moss over rock; thallus green, squamules ±erect; apothecia with orange to brown-orange disk, the margin fringed with lobules the same color as the thallus — ***Psoroma hypnorum***

6b Apothecia otherwise or apothecia absent — 7

7a Squamules thick, attached to substrate with hairy filaments; on soil or soil on rock; apothecia convex to spherical — ***Psora*** and ***Toninia***

3 These three genera can be distinguished reliably only by viewing microscopic characteristics.

7b Apothecia absent; squamules small, foliose, with a green to yellow-green corticate upper surface and clearly differentiated and easily viewed lower surface that is cottony and without a cortex; attached at one edge; on bark or wood or moss on bark or wood **Cladonia** (squamules only)

Narrow-lobed foliose

1a Upper cortex K+Y; lobes white or pale gray or pale green 2
2a Isidia present; upper surface of lobes pale green **Imshaugia aleurites**
2b Isidia absent; upper surface of lobes pale gray to white 3
3a Lower surface cottony or sorediate, without a cortex; apothecia present or not; black or white cilia present **Heterodermia**
3b Lower surface corticate, pale to tan or black; upper surface lacking isidia; soredia or apothecia present **Physcia**
1b Upper cortex K-; lobe color various 4
4a Rhizines present on lower surface 5
5a Rhizines thickly squarrose, often longer than the lobe is wide; lobes pruinose; on softwood or hardwood bark, especially oaks **Physconia**
5b Rhizines simple 6
6a Lower surface white to pale tan; rhizines pale, thick, stout; lobes ascending; soredia present in small lip-shaped soralia on lobe tips and margins; on hardwoods, sometimes rock **Physciella**
6b Lower surface dark brown to black, sometimes paler towards lobe tips; rhizines simple, black; lobes appressed to substrate; soredia or apothecia present; on bark or rock **Phaeophyscia**
4b Rhizines absent, or thallus too closely appressed to substrate to tell 7
7a Upper surface of lobes green-gray to brown-gray, thallus <20mm diameter, tightly appressed to the substrate; soredia present on upturned margins **Hyperphyscia adglutinata**
7b Upper surface of lobes pale brown to dark brown, thallus not appressed to substrate; lobes elongate, narrow, channeled; apothecia or marginal soredia present **Tuckermannopsis**

Broad-lobed foliose

1a Lobes some shade of brown: olive-brown, pale brown, brown to dark brown or almost black 2
2a Thallus small, <3cm, growing ± closely attached to the substrate; upper surface light to dark olive-brown; isidia or apothecia present; lower surface pale brown; short stout rhizines present 3
3a Medulla C+R or pink (fleeting), KC+R or pink, P- **Melanelixia**[4]
3b Medulla K-, C-, KC- 4
4a On bark or wood; medulla UV- **Melanohalea**
4b On rock or moss on rock; rarely on wood 5
5a Cortex N+ blue-green **Xanthoparmelia** subgenus **Neofusca**
5b Cortex N-; medulla UV+W **Montanelia**
2b Thallus typically larger, ±ascending, not appressed to substrate; olive-brown to dark brown, paler when growing in shade; soredia, or apothecia and/or pycnidia present; lower surface slightly paler than upper; rhizines absent or scarce **Tuckermannopsis**
1b Lobes some shade of gray: gray, whitish-gray (sometimes with a yellowish cast), green-gray or blue-gray 6
6a Upper surface greenish, or bluish-green to gray green, with obvious white markings (pseudocyphellae) 7
7a Pseudocyphellae linear, forming a reticulate network; soredia or isidia present; lower surface jet black with a brown margin; rhizines black, abundant, dense, simple or forked or squarrose **Parmelia**
7b Pseudocyphellae round, not reticulate; soredia marginal on upturned lobe edges in older parts of thallus, or laminal and arising from pseudocyphellae; lower surface pale to black; rhizines abundant and short **Punctelia**
6b Upper surface variously colored but without pseudocyphellae 8
8a Lower surface entirely black; rhizines black, sparse to absent 9
9a Medulla C-, KC-; lower surface intricately wrinkled **Esslingeriana idahoensis**
9b Medulla C+R or pink, KC+R or pink; lobe tips squared off 10
10a Apothecia and pycnidia present, soredia absent; lobes with black marginal cilia, sometimes only in the axils where lobes meet; lobes somewhat appressed to the substrate, edges lifting; rhizines black, unbranched **Parmelina coleae**

4 Species in *Montanelia*, *Melanohalea* and *Melanelixia* until recently were in the genus *Melanelia*. With new divisions based on molecular work, these lichens require keying to species to be certain of genus, so this part of the key is something of an approximation.

10b Soredia present, terminal and resulting from the breakdown of the cortex, or terminal to laminal and growing in association with pustulate eruptions from the upper cortex; cilia absent; lobes not closely attached to the substrate; mature rhizines forked ***Hypotrachyna***

8b Lower surface white, or pale brown, or brown and black, or a combination of these colors 11

11a Cilia present, although sometimes small and/or sparse; lower surface black with a narrow to broad brown margin; isidia or marginal soredia present, rarely with apothecia ***Parmotrema***

11b Cilia absent; lower surface white, brown or black, or a combination of these colors; soredia, isidia or apothecia present ***Platismatia***

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Genera and Species Included in the Keys

In the list below, parentheses around the species name means that you can use this key to identify that species, but that there are other species in that genus that will key only to genus.

Alectoria
Baeomyces rufus
Bryoria
Candelaria
Cladidium bolanderi
Cladonia
Collema
Dendriscocaulon
Dendrographa
Dermatocarpon
Endocarpon
Esslingeriana idahoensis
Evernia prunastri
Flavoparmelia (caperata)
Flavopunctelia
Fuscopannaria
Heterodermia
Hyperphyscia adglutinata
Hypocenomyce
Hypogymnia
Hypotrachyna
Imshaugia aleurites
Kaernefeltia
Koerberia
Lecanora (phryganitis)
Leptochidium albociliatum
Leptogium
Letharia
Lichinella
Lobaria
Loxosporopsis corallifera
Melanelia
Melanelixia
Melanohalea
Nephroma (laevigatum)
Niebla (cephalota)

Nodobryoria
Normandina pulchella
Pannaria
Parmelia
Parmelina coleae
Parmotrema
Peltigera
Peltula (euploca)
Phaeophyscia
Physcia
Physciella
Physconia
Pilophorus acicularis
Placidiopsis
Placidium
Platismatia
Polycauliona (coralloides)
Polychidium muscicola
Pseudocyphellaria
Psora
Psoroma hypnorum
Punctelia
Ramalina (R. puberulenta, R. menziesii)
Roccella
Scytinium (palmatum)
Sphaerophorus
Stereocaulon
Sticta
Sulcaria
Teloschistes
Thamnolia vermicularis
Toninia
Tuckermannopsis
Umbilicaria
Usnea (longissima)
Vulpicida canadensis
Waynea californica
Xanthomendoza
Xanthoparmelia
Xanthoria (parietina)

Symbols, Spot and UV Test Abbreviations:

-	a negative spot test reaction
+	a positive spot test reaction
<	less than
>	greater than
±	more-or-less
C	sodium hypochlorite (household bleach)
K	KOH; potassium hydroxide
LM	compound light microscope needed
N	nitric acid
O	orange
P	para-phenylenediamine
R	red
UV	ultraviolet light
W	white
Y	yellow

Please note that some of the substances above are caustic, corrosive, or suspected of being carcinogenic. Ultraviolet light can cause skin and eye irritation; wear safety glasses. Fischer Scientific has Safety Data Sheets available for all of these substances at https://www.fishersci.com/us/en/catalog/search/sdshome-.html.

Noteworthy Collections from California

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Abstract

Scytinium callopismum is collected for the third time in California. *Scytinium pruinosum* is reported from Santa Cruz County as the second collection for California. *Lempholemma chalazanum* is reported from Santa Cruz County representing only the second collection from northern California. *Arthonia* aff. *polygramma* has been relocated in Santa Cruz County after a 118-year lapse in northern California. *Vezdaea leprosa* is reported new to California and the west. The lichenicolous fungus *Kalchbrenneriella cyanescens* is reported new for the United States. *Stenocybe fragmenta* is reported new for California.

Arthonia* aff. *polygramma Nyl. (Figures 1-3)

Santa Cruz County. Forest of Nisene Marks. On *Notholithocarpus densiflorus* twigs along the Buggy Trail, elevation 70 m, 36.99829, -121.90569, March 1, 2023, *Kellman & Peterson 9677.* On fallen branch of along Mesa Road, Aptos, elevation 80 m., 36.98778, -121.91581, March 24, 2023, *Kellman 9700.* Both collections in hb. Kellman.

Thallus white, continuous, C-, K-, with white pruina that fluoresces bright yellow (Figure 2), apothecia variously branched or round, not stellate, blackish with pruinose margins (Figure 1). Spores 3(4) septate, with enlarged end cell, hyaline. 19.3-24.4(25.7) x 5-6.2 (9.4) (Fig 3), hymenium IKI reddish orange.

Per McCune (2017) and Grube (2007), there are 4 western species in *Arthonia* that have spores with an enlarged end cell. *A. illicina* and *A. cinnabarina* have up to seven septa and range in length from 25-36 µm and 20-33 µm respectively. *A. stellaris* has 2-4 septa with a length ranging from 15-17 µm. Its apothecia are more distinctly stellate. *A. polygramma's* apothecia are intermediate between the relatively entire *A. pruinata* and the highly branched *A. stellata* and does not achieve the linear lirellae of *A. atra.*

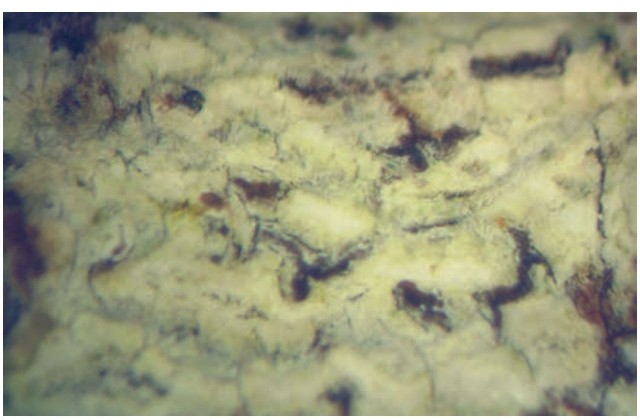

Figure 1: *Arthonia* aff. *polygramma* habit

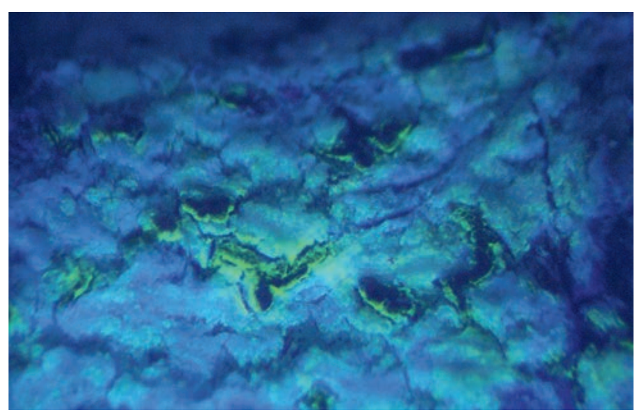

Figure 2: *Arthonia* aff. *polygramma* habit in longwave UV light

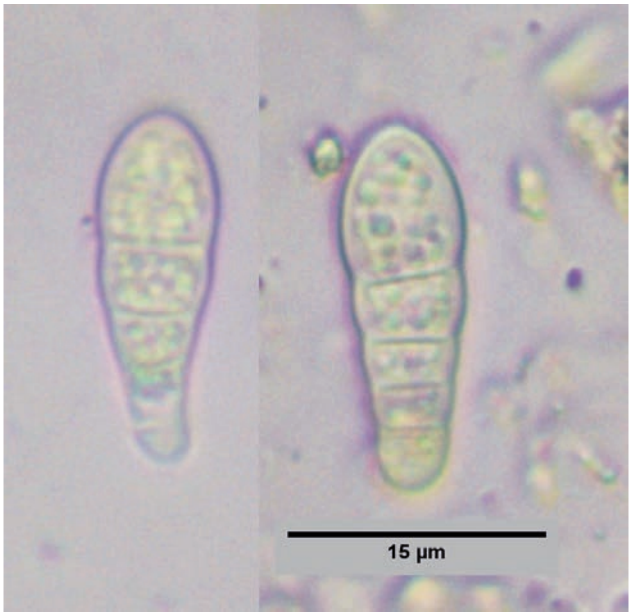

Figure 3: Spores of *Arthonia* aff. *polygramma* in water

The majority of California specimens are from southern California with the exception of a Herre 1905 collection from Castle Rock State Park, and another 1905 (FH) collection annotated by Patricio Ponce de León from Alum Rock Park in Santa Clara County, *Herre 18* (F). Noble (1982) noted one Canadian collection {Noble 119 (UBC)} which was later annotated as *A. stellaris* by Björk.

Arthonia polygramma was described by Nylander from a collection from Bogota, Colombia (Nylander 1863). Outside of California, this species is also reported from Florida, Cuba and Brazil. Noble (1982) stated that *A. polygramma* is close to the European *A. fuliginosa* (Turn. & Borr.) Flot., with the only difference being that *A. fuliginosa* has a reddish orange hymenial reaction to IKI. However, Hasse (1913) in his description of *A. polygramma* says that the hymenium does turns reddish orange with IKI. This suggests that the California collections represent either a chemotype or a separate, yet unnamed species.

Curiously, Grube (2007) ignored this whole question, and may not have examined the 19 Hasse California collections named *A. polygramma,* stating that the taxon was "dubious". His keys do mention a fifth macrocephalic species, *Arthonia pyrrhuliza* Nyl. However, drawings of this taxon on an isotype sheet in NY do not show an enlarged end cell.

Scytinium callopismum (A. Massal.) (Figures 4-6)
=*Collema callopismum A. Massal.*
=*Leptogium rhyparodes* Nyl.

Santa Cruz County. On limestone rock, about 1 meter above the high water mark of the pond in Springtree Quarry. In partial shade of *Salix* trees. Elevation 100 m, 36.98292, -122.04774, March 16, 2023, *Peterson & Kellman 9685*, (hb. Kellman)

Photobiont *Nostoc.* Thallus black, with white rhizines, appearing mostly erect in crannies between limestone crystals, lobes narrow without a differentiated cortex, interior with loose, elongated hyphae. Apothecia at first immersed, later plane and sessile (Figure 4). True exciple and subhymenium of globose or sub ellipsoid cells (Figure 5). Schultz *et al.* (2004) labeled them subparaplectenchymatous. Spores broadly ellipsoid, submuriform 20-22.7 X 12-13 µm (Figure 6).

This is the third collection from California. The first (as *Leptogium rhyparodes*) was made by Hasse, Exs.-94 (ASU) from the Santa Monica Range in May of 1913. David Toren collected it in Lake County in 2017 on calcareous rock *Toren 10-155* (CAS) (determined by T. Carlberg) Other collections from the United States are one from Alaska, two from Washington, one from Oregon, and one from Nevada and one from Arizona. (Consortium of Lichen Herbaria 2023) (hereafter CLH).

Lempholemma chalazanum (Ach.) de Lesd. (Figures 7-9)

Santa Cruz County. On soil over limestone rock in Springtree Quarry, elevation 100 m, 36.98291, -122.04773, March 23, 2023, *Peterson & Kellman 9698* (hb. Kellman).

Photobiont *Nostoc*. Thallus blackish, mostly flat and entire. Apothecia at first flush, later adnate, plane, reddish (Figure 7,8). Spores simple, (Figure 9), ellipsoid with at least one end pointed, hyaline, 20-24

Figure 4: *Scytinium callopismum* habit

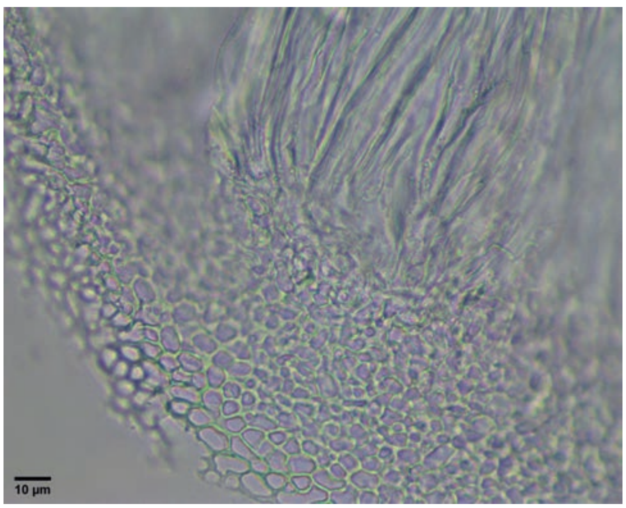

Figure 5: *Scytinium callopismum* subhymenium

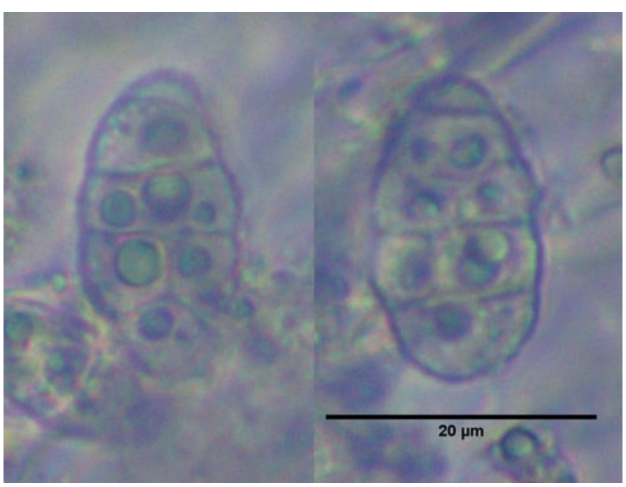

Figure 6: Spores of *Scytinium callopismum* (from Peterson & Kellman 9685)

X 12 µm, 8/ ascus.

Leptogium, Scytinium and *Collema* all have *Nostoc* as the photobiont, but *Lempholemma* differs by its simple spores.

As of this writing, there are 48 collections of *L. chalazanum* from California (CLH 2023), all from southern California except the present collection, and a 2000 Ron Robertson collection taken on a CALS field trip to the "Cedars" in Sonoma County, where it was growing on soil over serpentine rock. Tom Carlberg also collected it in Marin County in 2017. It should be looked for in other serpentine and calcareous rock habitats.

Vezdaea leprosa (P. James) Vězda (Figures 10-14)

Santa Cruz County. Henry Cowell Redwood State Park: On a mossy roadbank in *Sequoia sempervirens* forest along Highway 9 south of the Garden of Eden parking area, elevation 130 m, 37.03076, -122.06220, May 14, 2023, *Kellman 9765* (hb. Kellman, UCSC, CAS, NYBG)

Thallus appears as a green algal slime over a pleurocarpous moss. Apothecia tiny, pale, stalked, up to 0.2 mm in diameter and 0.2 mm tall, without exciple, hymenium not gelatinized, with abundant paraphyses that do not envelop the asci. Asci clavate, 8 spored. Spores narrowly ellipsoidal or fusiform, straight, mostly 1-septate, but often with multiple septae (-6), 10.2-16.8 X 2.6-4.2 µm.

While walking along Highway 9 (closed during storm damage repair) I saw mosses that were seemingly coated in a knobby algal slime. Through the hand lens, I saw tiny white dots that I thought were biatorine apothecia (Figure 10). Since this group of lichens tends to be under-collected (see below) I put it in a packet. When I got it under a dissection scope I was stunned to see the apothecia were fuzzy, and set on tiny stalks. My first thought was that this was some basidiomycete. Then I made a slide and put it under the compound scope and was even more surprised to find the apothecia looked like minute palm trees made up of only asci and paraphyses (Figures 11, 12) The spores were mostly 1 septate, but many had 2, and I saw one with 6 septae. Using McCune

Figure 7, 8*:* Top and bottom: *Lempholemma chalazanum* habit

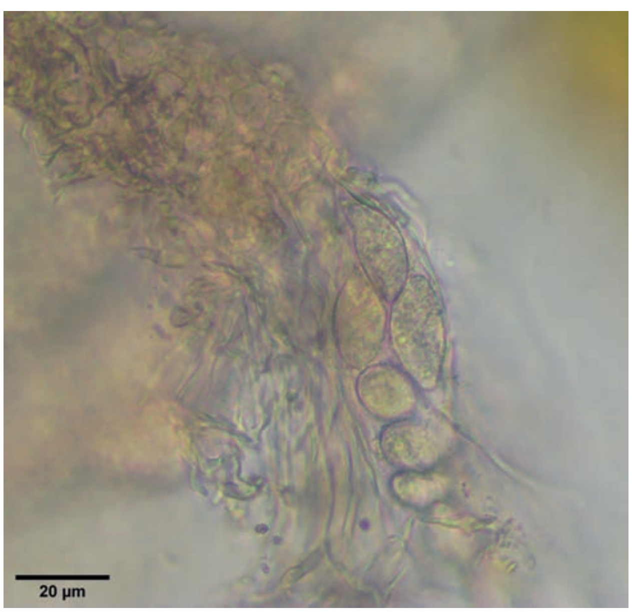

Figure 9: Simple spores of *Lempholemma chalazanum*

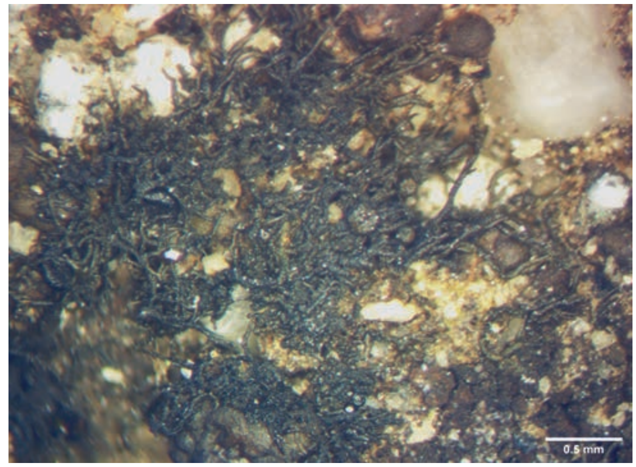

Figure 10: *Vezdaea leprosa* habit. Note the stalked apothecia and the knobby thallus

(2017) keys I attempted to work it through the calicioid keys and the septate lecideine keys but failed. At this point I was not even sure it was lichenized since the apothecial stalks erupted right from the moss leaves. I sent an email with photos to Bruce McCune, and he suggested the genus *Vezdaea*. I am embarrassed to admit that in spite of using these books for years, I was not even aware of a volume 1 preliminary key of apothecia without an exciple, where my lichen keyed right to *Vezdaea*. The specific key in volume II led me to *V. leprosa*. For confirmation, I looked for images on the internet, and found none. I then looked on CLH, and found that James Lendemer had collected this taxon multiple times in the east. So I sent him an email with pictures. He agreed with McCune about the genus and sent me a paper with a key to all species in the genus (Lendemer 2011). That key also led to *V. leprosa.*

Vezdaea leprosa normally grows in disturbed areas or sites that are subjected to metal deposition. Since the underlying rock is granitic, the only disturbance possible in the spot where it grew was the constant exhaust from cars travelling from Felton to Santa Cruz. The other possible difference between my collection and the descriptions in the literature (McCune 2017, Chambers *et al*. 2009) were the relatively common spores with multiple septae. Other

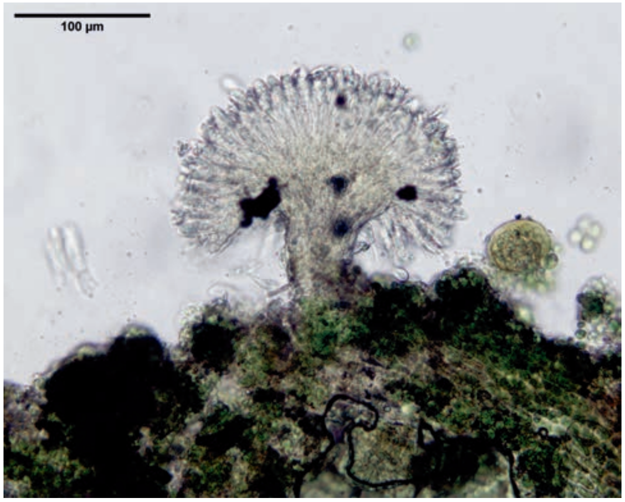

Figure 11: *Vezdaea leprosa* apothecium

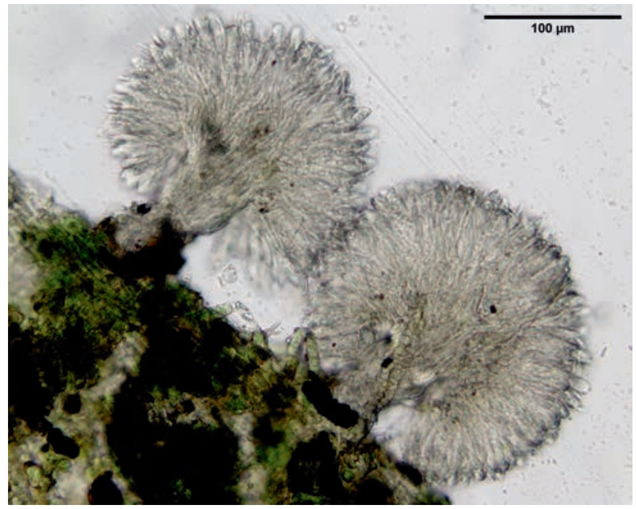

Figure 12: *Vezdaea leprosa* apothecia from below showing abundant paraphyses

Figure 13: *Vezdea leprosa* asci

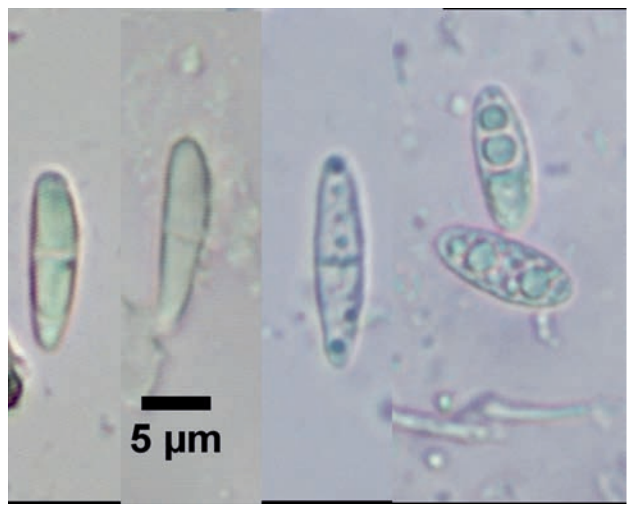

Figure 14: *Vezdaea leprosa* spores

species in the genus have variable septation but I found no literature citing more than one septum for *V. leprosa,* I sent a duplicate to James Lendemer, and he confirmed this as *V. leprosa.*

Per CLH, *V. leprosa* has never been collected west of the Rocky Mountains. Perhaps that is not surprising given the tiny size and the thallus that is concolorous with the green moss substrate. There is a suggestion that the apothecia are ephemeral so unless the collector is present at the right time, this lichen could look just like algae on moss. I was worried that they might not survive drying in my collection packet, so I took lots of pictures when they were fresh. However, apothecia are still present after being dry for two weeks.

Scoliciosporum pruinosum (P. James) Vezda (Figures 15-17)

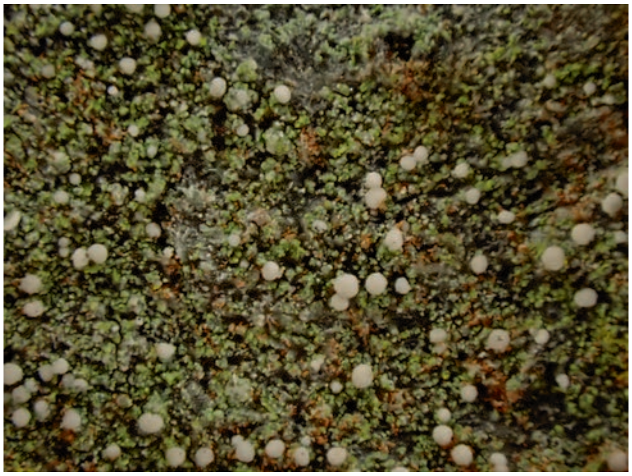

Figure 15: Habit of *Scoliciosporum pruinosum* (Figures. 15-17 from Kellman 9640)

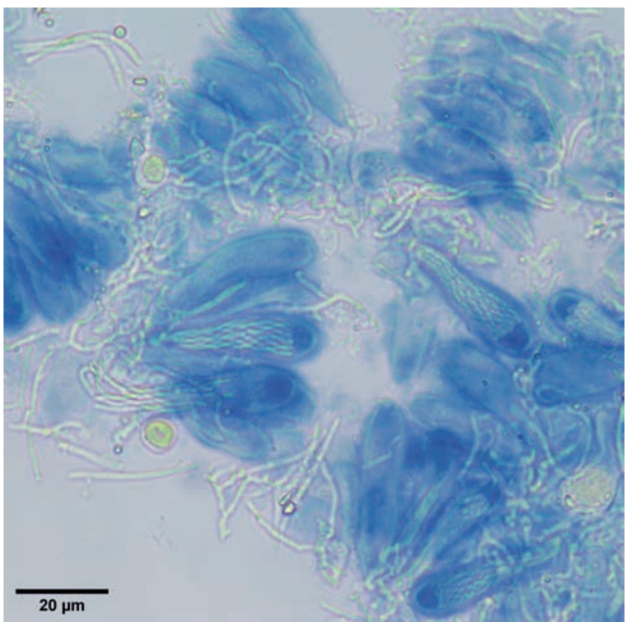

Figure 16: Asci with twisted spores and branched paraphyses of *Scoliciosporum pruinosum*

Santa Cruz County. On bark of a fallen oak tree off the Terrace Trail. Elevation 115 m, 36.98921, -121.91100, January 23, 2023, *Kellman 9640* (UCSC). After reporting the first record for California (Kellman 2022) I found this again in Santa Cruz County. The only difference between this collection and the Humboldt County specimen is that the apothecia are more scattered.

Figure 17: Spores of *Scoliciosporum pruinosum*

This collection and the *Vezdaea* collection illustrate a problem we are facing about the rarity of California lichens. They are inconspicuous lichens; they only show themselves to collectors who are looking very closely (and are perhaps a bit lucky!). They do not jump out at you from any distance at all. So are they rare, or just overlooked? My guess is the latter, but hopefully these collections can spur lichenologists in northern California to look for all tiny biatorine lichens.

Kalchbrenneriella cyanescens (Kalchbr.) Diederich & M.S. Christ. (Figures 18-20)

Santa Cruz County. Forest of Nisene Marks State Park. Parasitic on *Usnea* sp. On a twig fallen onto the Old Growth Loop Trail, elevation 40 m., 36.98772, -121.90970, April 9, 2023, *Kellman & Peterson 9721* (UCSC).

Appearing as a continuous white tomentum on the *Usnea* thallus (Figure 18) formed by chains of hya-

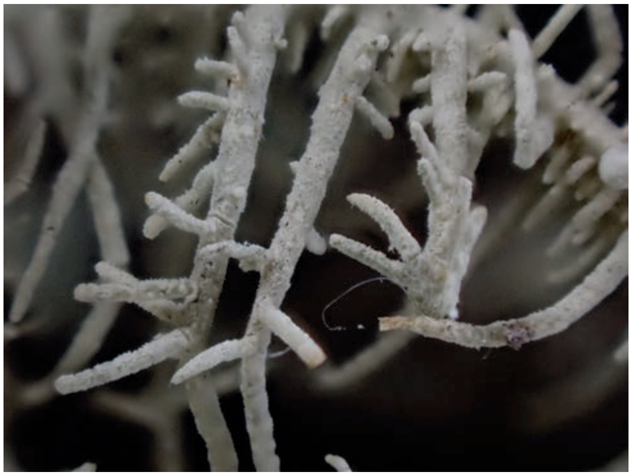

Figure 18: *Kalchbrenneriella cyanescens,* habit on *Usnea* sp.

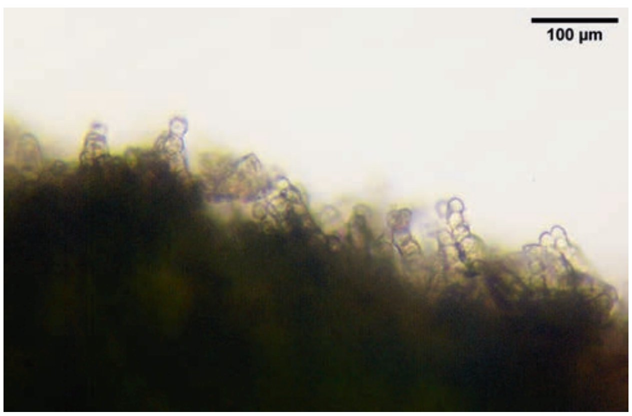

Figure 19: Fibril from *Usnea* infected with *Kalchbrenneriella cyanescens* showing conidial chains protruding from the surface.

Figure 20: Detail of conidial chain of *Kalchbrenneriella cyanescens*

line globose or sub-globose conidia (Figure 19), ornamented with warts and ridges (Figure 20), measuring 4.2-5.8 µm wide by 3.7-6.7 µm long, as many as 10 conidia per chain, rarely branched.

This taxon is unmistakable according to Diederich (2002): "*Kalchbrenneriella cyanescens* is easily recognized by the general aspect of infected *Usnea* thalli. These appear as matte, whitish (not bluish, as the epithet cyanescens might suggest), almost pruinose, and only at a high magnification can the dense tomentum formed by the conidiophores be recognized. It cannot be confused with any other known lichenicolous hyphomycete with hyaline conidia…"

Worldwide, there are 17 collections of *K. cyanescens* (Diederich 2002, CLH 2023). The majority of specimens are from northern Europe. There is one specimen from North America:
Canada, Alberta, Banff National Park, 1984, *Goward 84-1248* (UBC, hb. Diederich). This collection is the first from the United States.

Stenocybe fragmenta E. B. Peterson & Rikkinen (Figures 21-23).

Marin Co., Point Reyes National Seashore, North side of Mount Vision Road. On hardwood twigs believed to be *Frangula californica*. 38.0958, -122.8864, elevation 310 m. January 29, 2023. E. B. Peterson with CALS field trip, EBP#5402 (4 duplicates to be deposited at CAS and other herbaria).

During the 2023 CALS annual meeting at Point Reyes, a group visited a site where *Hypogymnia schizidiata* had been previously collected. While further exploring the site, I came across a hardwood shrub/tree with a *Mycocaliciales* fungus growing abundantly on the twigs (Figure 21). Knowing that I was in a different habitat from where most twig-inhabiting species have been found, and that the substrate hardwood was likely a new one for calicioid fungi, I figured there was a good chance that this would be something exciting.

Figure 21: *Stenocybe fragmenta* ascomata on twigs believed to be *Frangula californica.*

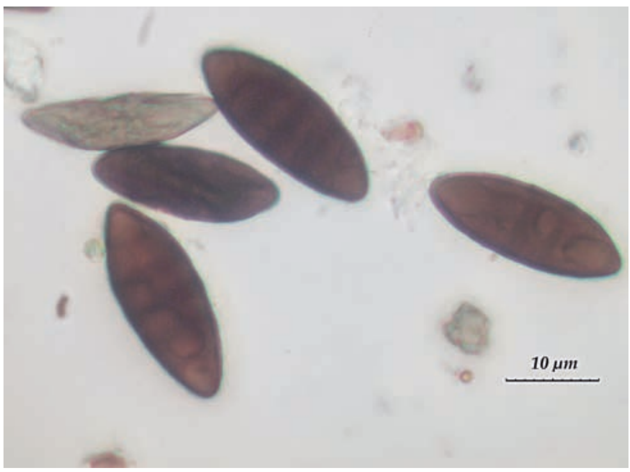

Figure 22: *Stenocybe fragmenta* spores from a fresh young ascomata, not showing the characteristic fragmentation.

Figure 23: *Stenocybe fragmenta* spores from a mature ascomata demonstrating the characteristic fragmentation.

Stenocybe fragmenta is a taxon I had the pleasure of discovering and describing myself, along with Dr. Jouko Rikkinen (Peterson & Rikkinen 1998). The spores were distinctive, not just in their combination of size and septation, but for their tendency to balloon in water mounts, often fragmenting along the septae. I first found it on *Cercocarpus* twigs in arid New Mexico then was astounded when Jouko turned it up on *Frangula purshiana* in Oregon (within Corvallis where we both lived at the time)! How does this taxon span these two habitats? We don't know. I then went to work in Nevada for many years... being between Oregon and New Mexico, and with plenty *Cercocarpus*, I always expected to find it there... but found none. I've searched both *Cercocarpus* and *Frangula purshiana* in many parts of California too, but without luck. In coming across this mycocalicialian fungus at Point Reyes, I immediately thought... what if?

Returning home and mounting a fresh young ascomata under my microscope, I found the spores had the right size and septation (Figure 19), but was initially puzzled: there was barely a hint of fragmentation. A second, older ascomata confirmed it though - spores stretching out like a xylophone, several breaking along the septae (Figure 20). *Stenocybe fragmenta* is now confirmed for California and I can add that really fresh young growth may have less tendency for spores to fragment.

Acknowledgements

The first author would like to thank Ron Goodman and Springtree Homeowners Association for permission to collect on their property. Thanks also to California State Parks for permitting collections on their lands.

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The diversity of lichens in Joshua Tree National Park and *Acarospora succedens* new for California

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Abstract

Since the publication of the checklist of lichens in Joshua Tree National Park, eight new records of lichens from Joshua Tree are reported, increasing the total diversity of described lichen species to 148 species. *Acarospora succedens* is reported new for California from the Little San Bernardino Mountains of Joshua Tree National Park. The description of *Acarospora obnubila* is considered heterogenous in Knudsen (2007). *Acarospora obnubila* s. str. is a synonym of *A. elevata*. Specimens determined as *A. obnubila s. lato* need revision. The specimens lumped in *A. obnubil*a in Joshua Tree NP study represent four undescribed taxa.

Keywords

Acarosporaceae, *Acarospora interspersa*, *A. nashii*, *Dimelaena suboreina*, lichenicolous lichens, Mojave Desert, Sonoran Desert

2010 to 2014, with support from grant from the National Park Service and Czech Republic we worked on an inventory of the lichens of Joshua Tree National Park (Knudsen 2013). One hundred and forty-one described species of lichen were reported from Joshua Tree NP (Knudsen et al. 2013a). This was based on 1958 collections from 231 sites. The large sampling captured the true diversity of lichens in this national park which includes both the Sonoran Desert and the Mojave Desert. We returned to Joshua Tree NP in March 2023 to collect reference specimens of *Acarospora peltastica* Zahlbr. for a genomic study to explore possible hybridization or introgression in the *Acarospora strigata* group. Inspired by Joshua trees and the lichens, we re-examined our records from the Joshua Tree NP and found we had not reported *Acarospora succedens* H. Magn. new for California, and we needed to update the checklist.

Since we published the checklist in 2013, we have collected *Peltula omphaliza* (Nyl.) Wetmore in Berdoo Canyon, a desert wash habitat in the Little San Bernardino Mountains (*Knudsen 18321* & *J. McCarthy*, SBBG). Across the San Andreas fault from the Little San Bernardino Mountains in the San Jacinto Mountains, *P. omphaliza* was collected by Hasse in Palm Springs and by Clifford Wetmore above Palm Desert (CLH 2023). We collected *Lecanora peltastictoides* Hasse in four locations of Joshua Tree NP including the Coxscomb Mountains (Knudsen & Kocourková 2013). We made a new combination, *Aspicilia peltastictoides* (Hasse) K. Knudsen & Kocourk. Recently Jason Hollinger collected specimens in Nevada (CLH 2023). It was originally described from Palm Springs, California (Hasse 1914). During our March 2023 trip, we determined *Acarospora superfusa* H. Magn. at the top of Eureka Peak (*Knudsen* 19467 & *Kocourková,* SBBG). This species was previously reported in California from the Clark Mountains and Anza-Borrego Desert State Park (Lendemer & Knudsen 2011). And we report *Acarospora succedens* H. Magn. new for

California.

We described four new species of lichen which occur in Joshua Tree NP since the checklist was published. *Heteroplacidium transmutans* K. Knudsen, Breuss & Kocourk, was described from the Sonoran Desert (Anza Borrego) and five paratypes were collected in Joshua Tree National Park (Knudsen et al. 2014). It is an obligate lichenicolous lichen morphing out of the yellow *Acarospora radicata* H. Magn. The holotype of *Lecidea strutura* K. Knudsen & Lendemer is from the San Bernardino Mountains but its center of diversity was in Joshua Tree NP (Knudsen et al. 2017). This species was reported from the Alps in Austria. The type locality of *Dimelaena lichenicola* K. Knudsen, Sheard, Kocourk. & H. Mayrhofer is in upper Covington Flats in Joshua Tree National Park (Knudsen et al. 2013b). It is a lichenicolous lichen growing on *Dimelaena oreina* (Ach.) Norman. It also occurs in Italy. *Sarcogyne paradoxa* Kocourk. & K. Knudsen can have an endolithic lichenized thallus as well as being a symbiotic parasite on crustose lichens (Knudsen & Kocourková 2020). It has been collected in China (Nurtai, pers. comm.) This brings the total reported species to 149 species.

Since the publication of the checklist, we revised *Acarospora obnubila*. In our recent keys the holotype of *A. obnubila* from Arizona is treated as a synonym of *A. elevata* H. Magn. (Knudsen et al. 2023). The description of *A. obnubila* in the Sonoran Lichen Flora is heterogenous (Knudsen 2007). This means it was based on a broad species concept encompassing multiple taxa. Identifications of *A. obnubila* by the first author (K.K.) are rarely *A. elevata* and all need to be revised and several are undescribed taxa. *Acarospora obnubila* reported from Joshua Tree NP is not one species but 4 undescribed brown taxa. One of these taxa was collected by Steve Sharnoff on Eureka Peak and can be seen as *A. obnubila*. in Sharnoff (2014). We subtracted *A. obnubila* from number of described lichens from Joshua Tree NP for a total of 148 described lichen species.

Undescribed taxa are not included in the total reported species of lichens in Joshua Tree NP. We are currently preparing a paper describing new species from California including at least four new species for science from Joshua Tree NP.

TAXONOMY

Material and Methods

See Knudsen et al. 2023. The description of *Acarospora succedens* is revised from the description of *A. interspersa* in Knudsen 2007.

Acarospora succedens H. Magn., Meddn Göteb. Bot. Trädg. 5: 71 (1930) [1929]. Type: USA. New Mexico: Environs de Las Vegas, Arsène Brouard 19950 (Hb. B de Lesdain, holotype, lost in WW2, n.v., FH! isotype).

=*Acarospora interspersa* H. Magn., Annals Cryptog. Exot. 6(1): 45 (1933). TYPE: Type: USA. New Mexico: Environs de Las Vegas, Canon Sud, Arsène Brouard 20557 (UPS! holotype).

Figure 1: *Acarospora succedens*. Knudsen 12872 (SBBG). Image by Jana Kocourková

Description

Hypothallus endosubstratal, no algae observed. Thallus areolate, to 5 cm wide; areoles round to irregular, flat to convex, (0.2–)1.0(–1.3) mm in diam., 0.2–0.6 mm thick, solitary, dispersed, or emerging along an axis from cracks in the rock, or morphing out of other lichens, becoming contiguous through replication by division. Upper surface dark to yellow brown or an orange brown, sometimes glossy, epruinose, smooth at first becoming rugulose and densely fissured in mature areoles, the accession fissures beginning often as small pits. Epicortex 6–35 µm thick, with thin periclinal to intricate hyphae often visible. Upper and lateral cortices paraplectenchymatous but originating from anticlinal hyphae, 30–40 µm thick, upper layer various shades of golden or reddish brown fading into lower hyaline zone 15–20 µm thick, variable. Algal layer uneven, algal cells not dense, interrupted by hyphal bands (but in younger specimens appearing solid). Medulla white, obscure, intricately prosoplect-enchymatous. Lower surface white, ecorticate, narrow around the mycelial base of the areole which is broadly attached to substrate, continuous with the hypothallus and the medulla, and eventually elevating the areole without forming a stipe (gomphate).

Apothecia usually 1 per areole, forming in the center of the areole, immersed, rarely reducing the areole to a thalline margin, rarely 2–4 apothecia. Disc brown or black, plane, smooth, or often rugulose with plectenchyma forming lumpy formations. Parathecium expanding around disc to about 35 µm wide. Hymenium pale yellow to hyaline, 80–110 µm tall, epihymenium reddish brown, thickly conglutinated, 15–20 µm thick, paraphyses 1.5–2.0 µm wide at base, apices expanded to 3–4 µm wide, hymenial gel IKI+ blue turning red, hemiamyloid. Asci narrowly clavate, 70 × 10–15 µm, 100+ ascospores hyaline, simple, ellipsoid (3–)4.5–6 × 1.5–2 µm. Subhymenium c. 10 µm thick, IKI+ dark blue. Hypothecium distinct, c. 10 µm thick. Pycnidia about 100 µm in diam., conidia 2.5–3.0 × 0.8–1 µm (Magnusson 1933). Secondary metabolites with HPLC (Knudsen 2007): gyrophoric acid (major), lecanoric acid (minor), 3-hydroxygyrophoric acid (trace), methyl lecanorate (trace). Spot tests: cortex KC+ C+ red, K-. P-. ITS: OR887204.

Ecology and distribution

Usually in full sun on non-calcareous rock, granite, volcanic rock, and sandstone, facultative lichenicolous lichen on *Aspicilia, Dimelaena* and other crustose lichens, widespread in U.S.A. (Arizona, California, Nevada, New Mexico) and Mexico (Baja Sur, Chihuahua, Guadalupe Island and Sonora). (CLH 2023). Reported new and rare for California. The Little San Bernardino Mountains where it was collected has been poorly explored for lichens and more populations are expected as well as possibly on the Sonoran Desert side of the San Jacinto Mountains.

Differentiation

Brown species with C+ reactions of the cortex are frequent in California: *Acarospora fuscata* s. lato group (Knudsen 2007; Knudsen et al. 2019; see discussion of *Acarospora agostiniana* K. Knudsen, Kocourk. & Hodková in Knudsen et al 2023), *A. nevadensis* H. Magn. (Knudsen & Werth 2008), *A. interposita* var. *nitidella* H. Magn. (Magnusson 1929), *A. obpallens* (Nyl. ex Hasse) Zahlbr. (Knudsen 2007), *A. rosulata* H. Magn. (Knudsen et al. 2010), the *A.*

squamulosa group (see discussion in Knudsen et al. 2023), *A. thamnina* (Tuck.) Herre (Magnusson 1929; Knudsen 2007) and *Glypholecia scabra* (Pers.) Múll. Arg. (Ryan 2002). *Acarospora succedens* differs from all these species in having densely fissured yellow brown to dark brown areoles with thick mycelial base. None of the other species in California producing gyrophoric/lecanoric acid are also facultative lichenicolous lichens. The small pits, which are the beginning of fissuring, on usually small sterile areoles can be confused with *A. obpallens,* but the fertile and fissured mature areoles are unmistakable as *A. succedens*. Magnusson reports an unusually long conidia length for an *Acarospora* (Magnusson 1933). We have not been able to verify it.

The current species should not be confused with *Acarospora succedens* in Knudsen (2007). After the discovery of an isotype of *A. succedens* (the holotype was lost in WW2), that taxon was revised as a new species, *A. nashii* K. Knudsen, from Colorado, Nevada, and Wyoming (Knudsen 2011). It is a lichenicolous lichen that does not produce gyrophoric and lecanoric acid. Both *A. succedens* and *A. nashii* were first collected growing on *Dimelaena suboreina* B.de Lesd. (a good species based on unpublished data of the Kocourková lab).

Specimen examined: United States, California, San Bernardino, Joshua Tree National Park, Little San Bernardino Mountains, Black Rock Canyon, 34.07369 -116.38592, 1213 m, on granite, Dec. 7, 2010, K. Knudsen 12876 (SBBG). Note: TLC (in solvents A, B, C): gyrophoric and lecanoric acids, Michalova 2011).

Acarospora elevata H. Magn K. Svenska Vetensk-Akad. Handl., Ser. III 7(no. 4): 179 (1929). TYPE: U.S.A. California. San Gabriel Mountains, Mojave Desert interface, Big Rock, 4500 ft., H.E. Hasse (FH! holotype)

=*Acarospora obnubila* H. Magn., syn. nov., K. Svenska Vetensk-Akad. Handl., Ser. III 7(no. 4): 263 (1929), syn. TYPE: U.S.A. Arizona, Adamana 1915 Plitti (UPS! holotype)

Descriptions

See Magnusson 1929 and Knudsen 2007 for *A. elevata.Acarospora elevata* was misidentified as *Acarospora nitida* H. Magn. by William Weber (Knudsen 2007).

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Vagrant Lichens of Northern California

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Abstract

Vagrant lichen species have the ability, due to rare morphological adaptations, to grow, subsist and multiply without the constraints of a substrate attachment. They are ground-dwelling and completely free-living. This allows for unique and possibly improved distribution capabilities, but also idiosyncratic threats. Both dense and sparse populations have been documented throughout the arid lands of the Great Basin, Idaho, and southern Oregon. Reports on vagrant populations in northern California are scant. We sought to locate and explore underreported populations, survey their health, and assess their risks.

Introduction

Vagrant lichen populations are typically found in open, arid areas with thin and scabby soils, becoming much more common east of the Cascade crest (McCune & Rosentreter 2007) (Fig. 2). The Klamath-Siskiyou region is one area west of the Cascade crest where vagrant lichens are found, due to unique climatic and geographic conditions more typical of the Great Basin and Intermountain West (Villella et al. 2010). They represent a small number of taxa, including the genera *Aspicilia, Dermatocarpon* and *Xanthoparmelia* (McCune & Rosentreter 2007) (Fig. 1). Vagrant lichen populations seem to be particularly sensitive to human-induced habitat changes and invasion by non-native plant species (Rosentreter 1993). The study area of northern California encompassed regions of Trinity, Siskiyou, Tehama and Shasta Counties in Spring 2022 following a year of heavy and widespread wildfire activity. These surveys were an extension of our work in Oregon with John Villella and Nils Nelson.

Methods

Due to the lack of published reports, location scouting was based on anecdotal documentation, intuitive searches informed by historical habitat descriptions, and habitat modeling using ArcGIS. Habitat modeling was employed during the second field trip in the Klamath and Shasta Trinity National Forests (Figure 12). Habitat data from our previously visited vagrant sites in Oregon were used to define the modeling parameters, including slope, NDVI, soil type and land use (Glenn & Restrepo 2022). Ground-truthing and adjustments from our previous modeling attempts in Cascade-Siskiyou National Monument (CSNM) informed our modeling decisions in northern California. During our field visits in California, we collected positive and negative site locations to further verify and refine the model in the future.

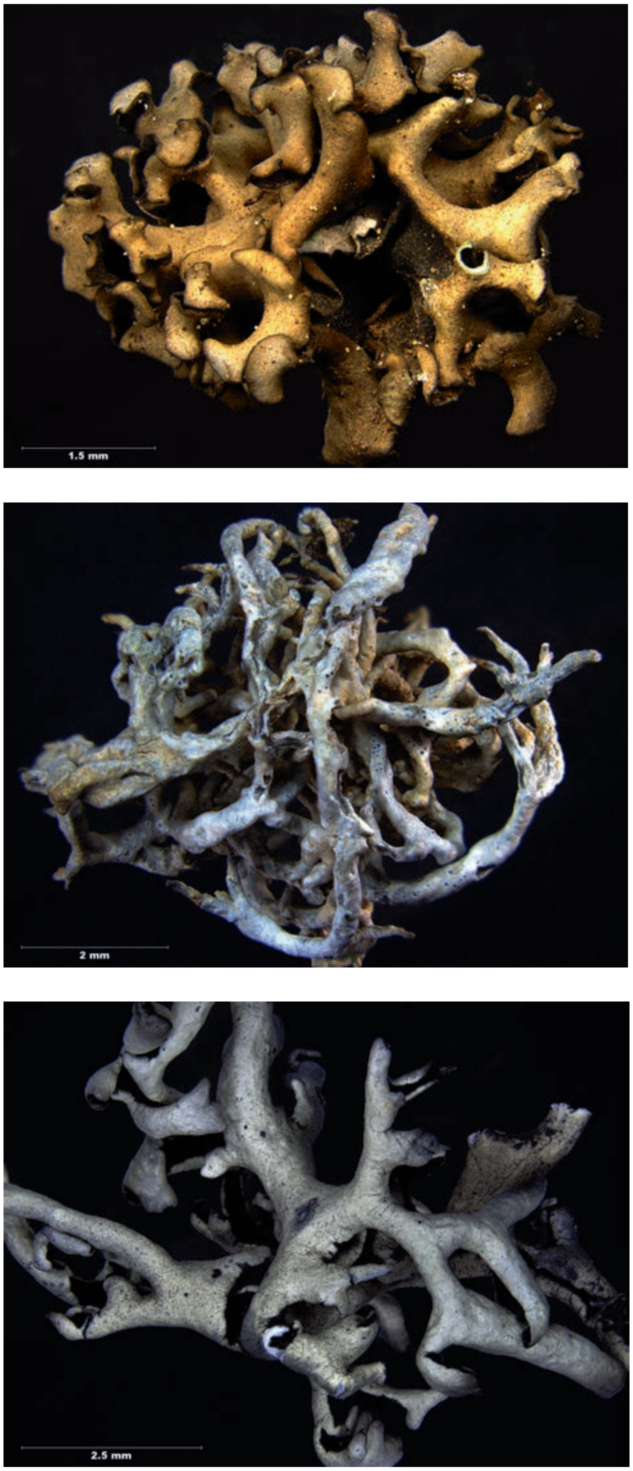

Figure 1: Examples of form. Top: *Dermatocarpon bachmannii*; Mid: *Aspicilia californica* var. *gigantea*; Bottom: *Xanthoparmelia sp.* Found in Jackson County, OR. Photos: A. Restrepo

Figure 2: Examples of habitat. Top: Pilot Rock (*D. bachmannii*). Bottom: Highway 66, type locality (*A. californica* var. *gigantea*). Jackson County, OR. Photos: A. Restrepo

At sites where vagrant lichens were found, we took photographs, collected voucher specimens, and recorded site characteristics. At one location we established a research plot and collected ground cover data using our previous methods from CSNM: forty subplots were located along four 30 ft transects, inside of which relative cover of vagrant lichen(s), moss, rock, grass, forb and bare ground were estimated. Grass composition was estimated as either native or non-native dominant for each subplot.

Field Synopsis

Following the annual Northwest Lichenologists and California Lichen Society Symposiums in Arcata, CA our field work incorporated regions such as Shasta-Trinity National Forest, Dye Creek Preserve, Hog Lake Trailhead, the Cascade-Siskiyou National Monument and Klamath National Forest.

Shasta-Trinity National Forest (STNF)

We first attempted to relocate anecdotally described vagrant *Dermatocarpon* populations found in ultramafic barrens around the Red Mountain area of STNF. On arrival, we were met with a landscape severely scorched and disturbed by the McFarland Fire of late summer 2021 (Fig. 4). The saxicolous form of *Dermatocarpon*, and its recently detached thalli, referred to as erratics (Rosentreter & McCune 1992), were present but no true vagrant populations were observed.

Dye Creek Preserve (DCP)

Provided with first-hand anecdotal evidence, we were granted access into the DCP to relocate purported populations. Due to lack of appropriate transportation in the Preserve we were unable to reach the location of the reported population. We were limited to areas of DCP we could only reach on foot. As a consequence of heavy cattle activity, any promising habitat had been thoroughly trampled and disturbed. Areas with high grass cover were also abundant (Fig. 5). No vagrant populations were observed.

Hog Lake Trailhead (HLT)

While camping east of Red Bluff, CA we analyzed landscape data of the surrounding area to see if there were zones within our habitat parameters. We noticed an area of interest near HLT. The trailhead was surrounded by a boulder field and characterized by dry, scabby, open terrain (Fig. 6). These areas also showed signs of cattle grazing activity and abundant invasive grass cover. Though both *Xanthoparmelia* and *Dermatocarpon* were present, no vagrant populations were found.

Figure 3: Photoshoot of our friend Stephen Sharrett in the fire-affected area. Photo: A. Restrepo

Figure 4: Top and Bottom: Views of burned areas and rocky barrens in the Red Mountain region of Shasta-Trinity National Forest. Photos: A. Restrepo & B. Glenn

Cascade-Siskiyou National Monument (CSNM)
Due to the prevalence of dense vagrant populations on the Oregon side of the CSNM, we attempted to enter the Monument at its most southern tip in California. We accessed CSNM on foot through Horseshoe Ranch, this being one of the only publicly accessible points of entry into CSNM. As a side note, this is also a documented locale of the rare *Umbilicaria phaea* var. *coccinea.* It is important to note that this area of CSNM is densely populated by wild horses, horse riders, and cattle. Being ground-dwelling, vagrant lichens are at considerable risk of trampling. Though we found saxicolous and erratic *Xanthoparmelia* and *Dermatocarpon*, and promising habitat, no truly vagrant populations were discovered (Fig. 7).

Figure 6: Terrain near Hog Lake Trailhead. Tehama County, CA. (Right). Photo: A. Restrepo

Figure 5: Top and Bottom: Dye Creek Preserve, Tehama County, CA. Photo: A. Restrepo

Figure 7: Top and Bottom: Terrain of Horseshoe Ranch within Cascade-Siskiyou National Monument. Photos: A. Restrepo

Klamath National Forest (KNF)
After failing to find notable populations of vagrant lichens during our previous visit to California, Britt developed a habitat model to better inform the searches and headed back for a second field trip. Using the model, scattered vagrant and erratic Dermatocarpon were found and documented in the McGavin Peak area. Evidence of ground disturbance from wild horses and cattle grazing was found in many of these locations. Substantial populations of *Umbilicaria phaea* var. *coccinea* were also found here.

Shasta-Trinity National Forest: Siskiyou County
Continuing south, Britt visited many areas in the potential habitat model. GPS points, notes, and photos were taken in locations with both promising and poor habitat, with the goal of verifying and further refining the model. Vagrant populations of *Dermatocarpon* and *Aspicilia* were located in a large, open, flat area just west of Penoyar, CA (Fig. 9). Two subpopulations were identified within a mile of each other, the second of which was deemed substantial enough to collect cover data using our microplot method. The Aspicilia specimens found here appeared to be *Aspicilia californica* var. *californica*, but identification of those and the *Dermatocarpon* specimens still need to be verified. Most of the large open area was surveyed, but much of it was grassy and disturbed by cattle grazing. The habitat supporting the vagrant populations had basaltic or andesitic rock, thin soils and sparse vegetation, including *Artemisia*, bunch grasses and moss cover (Fig. 8). These areas are very flat, and likely create some vernal pooling.

Located just over 15 miles north of Mount Shasta, the rock was extrusive igneous and the soils seemed somewhat loamy. Traveling closer to Shasta, the soils seemed to become more sandy, likely composed of Delaney gravelly sand (Soil Survey Staff 2023). No vagrant populations or suitable habitat were located closer to the mountain on the route taken. Heading south from Mount Shasta, the soils were similar, and the area was more heavily timbered. Openings which were visited closer to the mountain were not deemed to be suitable habitat, either due to slope, disturbance, logging debris, or lack of scabby ground cover with thin soils.

Figure 8: Vagrant habitat in Siskiyou County, Shasta-Trinity National Forest. Photo: B. Glenn

Lassen NF: Shasta County
Farther south, a large population of vagrant *Dermatocarpon* was located in an open area just north of Lake Britton and approximately 34 miles southeast of Mount Shasta (Fig. 11). Areas supporting vagrants here were often very scabby with basaltic rock and thin soils, likely holding water in the spring (Fig. 10). Disturbance also seemed to be lower in vagrant habitat, with mosses often persisting as ground cover. Areas that appeared to be more disturbed did not support vagrant lichens and were often dominated by invasive grasses.

Six subpopulations were documented at this location, some of which were very dense. Photos and collections were taken here, but no plot data was collected. A spring snowstorm traveling through the region prevented any further surveying on this trip. This location and other open areas nearby would be excellent places for future exploration.

Discussion
During the first portion of our field work, we observed that previously known populations of vagrant *Dermatocarpon* near Red Mountain seemed to be extirpated by the McFarland Fire. We had hoped that the rocky and often sparsely vegetated nature of

Figure 9: Top: *Aspicilia cf californica* var. *californica*. Bottom: *Dermatocarpon sp.* Siskiyou County, Shasta-Trinity National Forest. Photos: B. Glenn

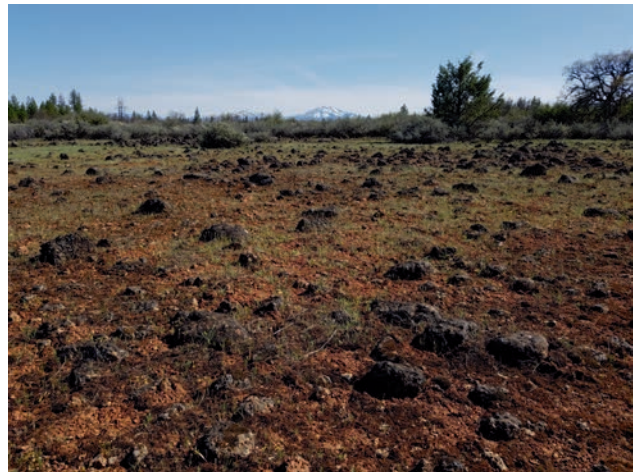

Figure 10: Vagrant habitat in Shasta County, Lassen National Forest. Photo: B. Glenn

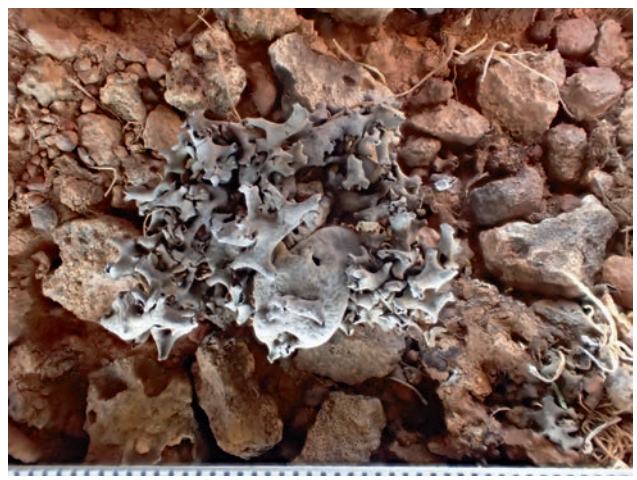

Figure 11: *Dermatocarpon sp.* Shasta County, Lassen National Forest. Photo: B. Glenn

the habitat would make vagrant populations somewhat resistant to fire, but this did not seem to be the case. *Dermatocarpon* were found attached to rock and recently unattached, but no true vagrant populations were observed. These findings are concerning, as many large fires have occurred in northern California in recent years. Additionally, decreased precipitation and increased temperatures due to climate change may increase the potential for large fires in the future. Continued monitoring in these areas could give valuable insight into post-fire response and recovery of vagrants.

We were unable to locate vagrant populations in potential habitats adjacent to Red Bluff, and in the southern tip of CSNM. These areas appear to be heavily utilized by wild horses and/or cattle, which may have impacted vagrant populations through disturbance, trampling or possibly herbivory. Invasive grass abundance was high at each of these locations and could also play a role in the absence of vagrant populations, due to their often-matted growth.

With the assistance of the habitat model, newly doc-

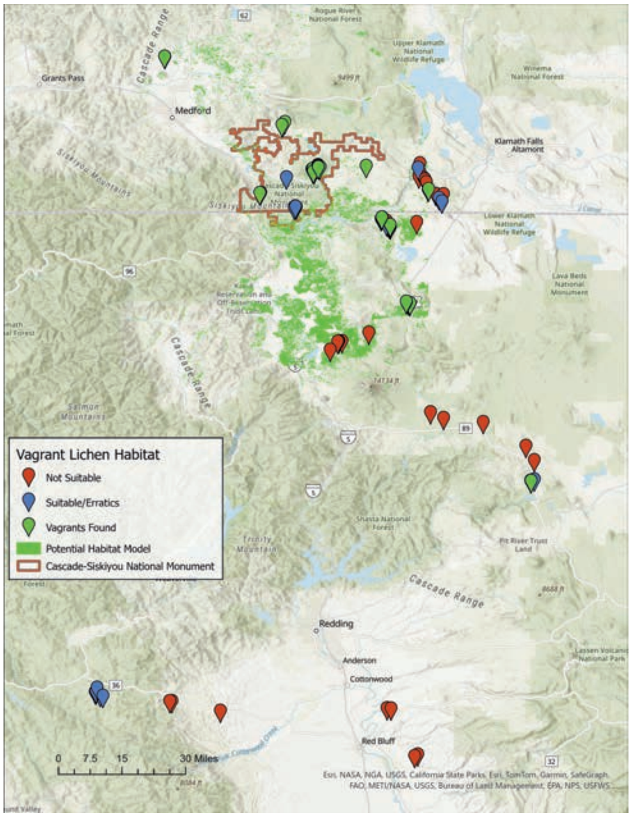

Figure 12: Map of sites visited in Oregon and California and the habitat model. This version of the model extended south to Mount Shasta.

umented vagrant populations of *Dermatocarpon* and *Aspicilia* were located in large, open areas both north of Mount Shasta in Siskiyou County and farther south in Shasta County. Further refining of the habitat model using the positive and negative data points gathered could also increase search efficiency in future surveying efforts. Additionally, many areas of potential habitat were found to be on private property, so private property will be removed from future versions of the model. The specimens collected on these trips are currently housed in the Evergreen State College herbarium, and further identification work needs to be completed so the occurrences can be properly documented.

As an aside, an additional site was located in Oregon near the California border while traveling to California that has gone unreported in our previous work and is somewhat outside the scope of this grant. The site is a large, seasonally wet opening along Slip Easy Road, containing a sizable population of vagrant *Dermatocarpon* and, if confirmed, the first known occurrence of vagrant *Aspicilia californica* var. *californica* in Oregon. There are large areas of potential habitat in this zone along the state border, but much of it is on private property.

Despite the vagrants' somewhat elusive nature on these trips, additional field searches are needed to locate and document unrecorded populations. The Modoc and Lassen National Forests to the east may also be good potential areas of study due to their drier climate and proximity to known populations of vagrant lichens in the Great Basin.

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Sulcaria isidiifera: Status and conservation methods for a critically endangered lichen on the central coast of California

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Abstract

We present a status update and conservation recommendations for the critically endangered lichen *Sulcaria isidiifera*. The population count and lichen community of *S. isidiifera* are characterized, and a translocation study is carried out.

Introduction

Lichens face many ongoing threats including climate change, forest fires, as well as increases in urban development (Miller et al. 2022, Allen et al. 2019, Ellis et al. 2014). At the same time, few legal structures exist to conserve and protect lichens, which underscores the need to study and develop methods to protect these underrepresented organisms (Davoodian 2015).

The splitting yarn lichen (*Sulcaria isidiifera* Brodo) was listed as Critically Endangered B2ab(i,ii,iii,iv,v) on the International Union for Conservation of Nature (IUCN) Red List in 2019 due to its very narrow distribution, a continuing decline in both its extent of occurrence and number of mature individuals, severe population fragmentation, and threats from development and fire (McMullin et al. 2019). *Sulcaria isidiifera* is also listed as Critically Imperiled (G1/S1) and at high risk of extirpation in the California Natural Diversity Database (CNDDB). It is one of 18 lichens of conservation concern in California listed in CNDDB (2023).

The entire population of *S. isidiifera* is restricted to a small area on the central coast of California in the vicinity of the Baywood-Los Osos and Morro Bay communities. The population is reported to occur over an estimated area of ca. 8 km^2 in and around several state and local protected lands including Los Osos Oaks State Reserve, Montaña de Oro State Park, Morro Bay State Park, Morro Dunes Ecological Reserve, and the El Moro Elfin Forest (McMullin et al. 2019). *S. isidiifera* is also known from herbarium collections in residential neighborhoods of Los Osos-Baywood, but these may have since been extirpated due to housing development (Carlberg & Knudsen 2007).

In this study, as part of the first author's M.S. thesis, we sought to further characterize the population status and ecology of this rare and threatened lichen. Additionally, we sought to develop methods for conservation translocation of *S. isidiifera* by testing the following hypotheses: 1) translocated individuals will not decline in vitality compared to undisturbed thalli; 2) host species will affect thallus vitality; 3) individuals placed on north-facing aspects will fare better than individuals on south-facing aspects and; 4) individuals that are placed closer to the ground will fare better than individuals placed higher on host shrubs.

Description

Sulcaria isidiifera is an epiphytic, fruticose lichen that is 3-5 cm in length (Brodo 1986). The thallus is a dull yellowish-white grading into light brown, with branches that split lengthwise to reveal linear soralia (Brodo 1986). The soralia are filled with brown, spinulose isidia and spinules (Brodo 1986). *Sulcaria isidiifera* is only known to reproduce asexually since no fertile forms have been observed. *Sulcaria isidiifera* grows on shrubs and trees in old-growth maritime chaparral stands (Figure 1).

Methods

To assess the current status of *S. isidiifera*, we carried out an exhaustive population count supplemented by transect surveys in all stands of maritime chaparral where populations had historically been identified. We also surveyed areas of potentially suitable habitat outside the known range of the species. Population counts considered the number of mature individuals which are defined by the IUCN as individuals capable of reproduction (Guidelines for Using the IUCN Red List Categories and Criteria 2022). Since *S. isidiifera* is only known to reproduce asexually, individuals were only counted if isidia were observed in the soralia.

Figure 1: *Sulcaria isidiifera* growing on *Adenostoma fasciculatum.* Inset photo: *Sulcaria isidiifera* viewed through a microscope. The soralia are seen with dark brown isidiia and spinules growing out of them.

Complete population counts were carried out in semi-open stands of maritime chaparral accessible on foot. *Sulcaria isidiifera* individuals were also observed in some stands where vegetation was deemed too dense to access without causing damage to the habitat. In these areas, a line-intercept method was utilized where 2x2-meter quadrats aligned along transects were surveyed to estimate the number of potential individuals throughout the stand. Transects were oriented from the edge of dense stands toward the center, with 3 quadrats placed at 10-meter intervals along the 30-meter transect, such that potential differences in the lichen population density at each interval were captured.

To further characterize the ecology of *S. isidiifera*, fine scale biotic and abiotic data were gathered including macrolichen community assemblage, vascular plant community data, and microclimate data. Macrolichen community data were gathered by surveying 60, 200-cm^2 quadrats randomly established in or adjacent to populations of *S. isidiifera* on branches of epiphyte-bearing shrubs. Quadrats within *S. isidiifera* populations were deemed "*S. isidiifera* habitat" while quadrats adjacent to *S. isidiifera* populations were deemed "non-*S. isidiifera* habitat". Quadrats were divided equally among these habitat types to provide a highly detailed comparison of macrolichen communities within maritime chaparral, and to find potential indicator species for *S. isidiifera*. Abiotic data were gathered using microclimate sensors (DS1923 Hygrochron iButton).

To develop methods for conservation translocation, a total of 30 thalli of *S. isidiifera* were randomly selected for translocation and monitored between May 27th, 2021, and July 14th, 2022. To minimize impacts to thalli, all individuals were collected in brown paper bags, placed in a clear plastic tub, and relocated the same day that they were collected, between 7:40 AM and 7:00 PM on May 27, 2021. To further minimize impacts to thalli and prevent incidental damage, whole branch sections on which *S. isidiifera* was growing, were clipped and translocated.

Of the 30 thalli, 24 were relocated and distributed between 2 host shrub species, *Adenostoma fasciculatum* Hook. & Arn. and *Arctostaphylos morroensis* Wies. & Schreib., in adjacent suitable habitat (0.3-2.7 km from their original location) that was otherwise uninhabited by *S. isidiifera.* These 24 thalli were placed on the north and south aspects of each new host shrub, and at either 0.5 or 1.0-meters from the ground. The remaining 6 individuals of *S. isidiifera* served as control thalli for this experiment and were removed from their host shrubs, transported with the experimental thalli, but then re-attached to the same location on their original host shrubs.

To assess translocation success, thalli were visually monitored, and vitality was measured using chlorophyll-*a* fluorescence as a proxy for thallus health (Figure 2). The parameter F_v/F_m was used to indicate the maximum photochemical quantum efficiency of photosystem II of the photobiont in *S. isidiifera* (Kitajima & Butler 1975). To capture other potentially important factors for translocation success, abiotic data were gathered at the substrate-level including microclimate temperature, humidity, and photosynthetically active radiation (measured in $\mu mol\ m^{-2}s$).

UPDATED POPULATION STATUS

A total of 11,549 mature thalli of *S. isidiifera* were counted. An additional number of individuals were estimated using two different interpretations of potential *S. isidiifera* habitat. With the inclusion of this estimate the total number of thalli was between 13,841-25,064. The overall population density of *S. isidiifera* was 24 thalli/acre. Among individual survey areas, population density was highest in Morro Bay State Park (164 thalli/acre) and lowest in Montaña de Oro State Park (9 thalli/acre). Densities were calculated using ArcGIS Pro 3.1.0 by dividing the total number of individuals by area of the minimum convex polygon encompassing the subpopulation.

Using the Guidelines for IUCN Red List Categories and Criteria (2022) the Area of Occupancy (AOO) and Extent of Occurrence were calculated, and each are 24 km^2 (Figure 3). Using this most recent popu-

Figure 2: Chlorophyll fluorescence measurement. Branches are being gathered together to cover the end of the probe for measurement (left). For the duration of all measurements, dim red lights were used for illumination to minimize ambient light exposure (right). Photograph on the left was taken as an example to demonstrate methods.

lation data, and accounting for the continued threats from development and a previously noted decline in mature individuals, *S. isidiifera* should maintain its status as Critically Endangered under the IUCN criteria B2ab(i,ii,iii,iv,v). Given these findings, *S. isidiifera* should also be listed under the Federal Endangered Species Act (ESA) which lists several qualifying factors including the "present or threatened destruction, modification, or curtailment of its habitat or range; inadequacy of existing regulatory mechanisms; or other natural or manmade factors affecting its continued existence" (Federal Endangered Species Act, 16 U.S.C. § 4).

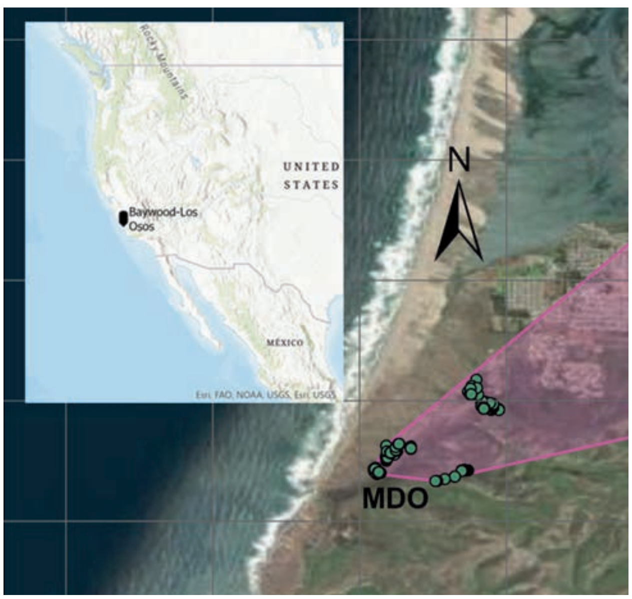

Figure 3: Map of *S. isidiifera* population. Pink area represents the minimum convex polygon. Green points represent the locations of hosts of *S. isidiifera*. A 2x2-km grid overlay is used to calculate the AOO and EOO. Labeled areas are Morro Bay State Park (MBSP), El Moro Elfin Forest (EF), Los Osos Oaks State Reserve (LOOR), and Montaña de Oro State Park. Population density was highest at the northern end of the AOO in MBSP (164 thalli/acre), and lowest at the southern end in MDO State Park (9 thalli/acre).

Ecology

Sulcaria isidiifera was observed exclusively in old-growth maritime chaparral habitat typically dominated by *Adenostoma fasciculatum* Hook. & Arn, *Ceanothus cuneatus (*Hook.) Nutt., and *Arctostaphylos morroensis* Wies. & Schreib. which grow on well-drained sandy soils. Coastal sage scrub and oak woodland vegetation communities intergraded with maritime chaparral habitat, but *S. isidiifera* was found primarily on chaparral species. The most common shrub species on which *S. isidiifera* grows is *A. fasciculatum* (918 hosts), followed by *C. cuneatus* (560 hosts), and *A. morroensis* (491 hosts).

During the study period from September 2021 through September 2022 microhabitat temperatures were relatively mild in *S. isidiifera* sites with averages ranging from 10°C in the winter to 16°C in the summer. Humidity in *S. isidiifera* habitat was relatively high year-round, likely due to its proximity to the coast and the persistent presence of heavy fog.

We identified a total of 24 macrolichen taxa among all quadrats in this study (Table 1). The *S. isidiifera* and non-*S. isidiifera* sample groups were composed of a similar group of macrolichen taxa. However, the number of taxa within quadrats in *S. isidiifera* habitat was slightly higher ($\bar{x}$=6.87) than in non-*S. isidiifera* habitat ($\bar{x}$=5.47), not including the presence *S. isidiifera* in the former group. This finding supports observations that individual branches on which *S. isidiifera* was growing were densely covered in macrolichens and had a relatively higher number of taxa, compared to branches in adjacent chaparral habitats.

In addition, one macrolichen taxon, *Leucodermia leucomelos* (L. Kalb) was found to be a good indicator for the presence of *S. isidiifera* in the study area. Other potential indicator species include *Usnea fragilescens* Hav. Ex. Lynge, *Ramalina leptocarpha* Tuck., and *Sulcaria spiralifera* (Brodo & D.

Hawksw.) Myllys, Velmala & Goward.

According to microclimate data that was gathered during this study, the humidity was relatively higher, and temperatures were slightly lower in *S. isidiifera* habitat compared to non-*S. isidiifera* habitat. These contrasting microclimatic conditions might account for the differences that were found in the composition of macrolichens found between the two sample groups.

Translocation Study

For the duration of this 14-month long translocation trial (May 2021-July 2022), we reported 100% survival of translocated thalli. All 30 thalli remained present and affixed to their respective branches. Visual assessment of thalli showed little to no change in color or size. Growth of thallus branches onto host substrates was not observed. Chlorophyll-*a* fluorescence was measured in experimental thalli, and a random selection of 30 undisturbed thalli. F_v/F_m values for translocated thalli ranged from 0.375-0.782, while values for undisturbed thalli ranged from 0.345-0.777. A significant difference in chlorophyll fluorescence was found between the experimental and undisturbed groups of *S. isidiifera* ($t(42.198)=3.127$, $p=0.003$). Interestingly, translocated thalli had a significantly higher measure of chlorophyll-*a* fluorescence ($\bar{x}=0.704$, $\sigma=0.035$) than the values measured in undisturbed thalli ($\bar{x}=0.655$, $\sigma=0.077$), which could indicate greater vitality in translocated thalli.

Overall, seasonal values of microhabitat temperature and humidity were highly similar when comparing treatment groups, host species, and aspects. However, compared to north-facing aspects of shrubs, temperatures measured on south-faces were an average of 1°C warmer, and photosynthetically active radiation was an average of 206.5 µmol $m^{-2}s$ higher. Despite these differences for south-facing aspects, no detectable negative outcomes were observed in thalli based on chlorophyll-*a* fluorescence. There was no significant difference detected for any of the chlorophyll fluorescence measurements between experimental groups in the translocation trial. The distribution of F_v/F_m values were also highly similar between tested groups.

These results support the hypothesis that 1) translocated individuals will not decline in vitality compared to undisturbed thalli. However, the evidence gathered did not support the hypotheses that 2) host species will affect thallus vitality; 3) individuals placed on north-facing aspects will fare better than individuals on south-facing aspects and; 4) individuals that are placed closer to the ground will fare better than individuals placed higher on host shrubs. It is likely that the duration of this experiment was not long enough for thalli to experience the potentially negative effects associated with microclimatic differences between aspect, height, and host species. Monitoring of these translocated thalli will continue on an indefinite basis.

Discussion

This study assessed the current status of *S. isidiifera* and highlighted the need for conservation actions that should be undertaken to protect this lichen. Given the diversity of lichens, their important role in ecosystems, and the lack of legal protections that exist there must be concerted efforts at both the regional and national level to protect these organisms.

Threats such as continued development throughout the range of *S. isidiifera*, increases in wildfire frequency and intensity, and climate change underscore the need to obtain listing status for rare and threatened lichens. Currently, the only effective measure of protection for lichens in California is at the federal level through the ESA. The next step in this project will be to submit a petition for ESA listing, which, if successful, would make *S. isidiifera* only the third lichen to gain these protections. In the

United States, only two lichen species are listed under the ESA: the rock gnome lichen (*Cetradonialinearis* [=*Gymnoderma lineare*] (A. Evans) J.C. Wei & Ahti) and the Florida perforate lichen (*Cladonia perforata* A. Evans) (Allen et al. 2019).

Other important avenues to pursue are protections at the state-level through the California Endangered Species Act (CESA), under which lichens are currently not eligible for listing. Efforts should be made to broaden the scope of CESA to include lichens and other sensitive yet overlooked taxa. *Sulcaria isidiifera* will hopefully serve as a model taxon which can pave the way for lichens and other underrepresented organisms to be continually studied and protected.

Acknowledgements

We would like to thank the organizations that helped fund this study: the California Lichen Society, the IUCN SSC Lichen Specialist Group, and Northern California Botanists. Their support for this study and for the continued research and conservation of lichens is greatly appreciated. We would also like to extend a huge thank you to the individuals who helped carry out this research including Michael Mulroy, Emma Fryer, Cameron Williams, Kate Lima, Jacob Mull, and Karli Yokotake. The work was not easy, but your help made it possible!

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Table 1. Table of lichen taxa identified during the course of the lichen community study. All taxa were found in or adjacent to *S. isidiifera* habitat in maritime chaparral and coastal sage scrub habitat.

Species List

Hypogymnia mollis L.H. Pike & Hale
Kaernefeltia merrillii (Du Rietz) Thell & Goward
Leucodermia leucomelos (L.) Kalb
Parmelia sulcata Taylor
Parmotrema perlatum (Hudson) M. Choisy
Ramalina farinacea (L.) Ach.
Ramalina leptocarpha Tuck.
Ramalina menziesii Taylor
**Sulcaria spiralifera* (Brodo & D. Hawksw.) Myllys, Velmala & Goward
Usnea cornuta Körb.
Usnea esperantiana Clerc
Usnea fragilescens Hav. Ex Lynge
Usnea perplexans Stirt.
Usnea rubicunda Stirton
Vermilacinia cephalota (Tuck.) Spjut & Hale

*Of note, *Sulcaria spiralifera* is listed as Endangered B2ab(I,ii,iii,iv,v); C2a(i) in the IUCN Red List of Threatened Species.

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CALS Grants Committee report for the 2022 Grant Cycle

Dear CALS members,

Despite distributing the call for applications widely, in 2022, the CALS Grants Committee only received two grant applications for a total of $2,456. I was hoping that the trend from 2021, when we received six great applications would continue, but I think one obvious explanation could be that there simply aren't that many people doing research on California lichens. If this is true, we need to change this trend!

The excellent grants evaluators agreed that both applications were well researched and would contribute to our general knowledge about lichens, so now funding depended on how much money was available to grants. Both projects were recommended for funding and thanks to the Board, who in recent years has been allocating more money to grants, we were able to fund both applicants.

I do hope that we can somehow increase the number of applications we're receiving. Perhaps we need to broaden the scope of grants program. If you have any suggestions as to how we can improve the CALS grants, I'd be more than happy to hear about it.

Rikke Reese Næsborg, Grants Committee Chair (grants@californialichens.org)

California lichens as models for symbiosis: testing whether vertical or horizontal photobiont transmission affects nutrient sharing

Principal investigator: Dr. Inga Conti-Jerpe
Postdoctoral Scholar, Museum of Vertebrate Zoology, University of California Berkeley, Berkeley, CA 94720
Funding provided: $1,456

Summary: Lichens are an archetypal example of a tightly-coupled symbiosis that can serve as a model for mutualisms wherein partners exchange nutrients. In lichens, the photobiont (a green alga, cyanobacteria, or both) provides carbon fixed through photosynthesis while the fungal mycobiont supplies other nutrients (nitrogen and phosphorus) and minerals. Some lichens show evidence of nitrogen and phosphorus recycling between myco- and photobiont partners. Access to and retention of multiple nutrient sources may explain lichen's tolerance for extreme environments (i.e. high latitudes, deserts, rock substrate; however, it is unknown if and how the amount of nutrient exchange and recycling varies across lichen diversity, and how this may influence species distribution. Lichens have evolved two mechanisms of photobiont transmission. Lichens that reproduce sexually rely on horizontal transmission; they release spores without photobionts into the environment that must re-lichenize. Alternatively, many lichens transmit their photobionts vertically though asexual propagation. Transmission strategies are thought to

influence coevolution between symbiotic partners, however there is little understanding of how they affect the functioning of these relationships, including nutrient sharing and recycling.

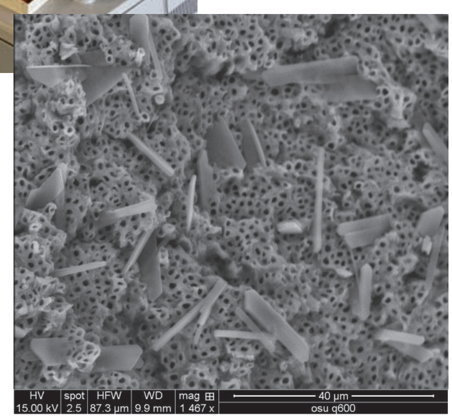
This project will analyze stable isotope data collected from the mycobiont and photobiont partners in six California lichen species to quantify their nutrient exchange. By including three species that lack vertical transmission (no asexual reproduction) and three species that exhibit vertical transmission (via asexual reproduction), I will answer two questions: 1) does the magnitude of nutrient exchange and/or recycling within lichens vary across species and 2) is there more nutrient sharing within lichens that exhibit vertical photobiont transmission? I hypothesize that the extent of symbiotic nutrient exchange/recycling varies across lichens and is higher in lichens with vertical transmission.

This work will enhance our understanding of the lichen symbiosis and show whether different nutrient sharing strategies contribute to species niches, and thus habitat selection and lichen distribution. Further, the results of this study will elucidate whether the evolution of vertical transmission is linked to nutrient sharing/recycling in an understudied symbiosis.

A Detailed Comparison of the Morphological Traits of *Stereocaulon intermedium* and *Stereocaulon sterile*

Principal investigator: Zane Walker
Undergraduate Student, Botany and Plant Pathology, Oregon State University, Corvallis, OR 97331
Funding provided: $1,000.00

Summary: Most *Stereocaulon* species in North America are arctic, boreal, and montane, but a few species extend south to California. Two species that reach their southern range limit in California are *S. intermedium* and *S. sterile* (2022, Tucker). Recent unpublished studies by McCune (ongoing) focusing on the molecular relationships among North American species of *Stereocaulon* suggest that *S. intermedium* and *S. sterile* are conspecific. However, based on gross morphological traits, *S. intermedium* and *S. sterile* have been presumed to be separate taxa. In *S. intermedium* the presence of apothecia on the apex of slender stalks that can exceed 6 cm contrast with the short appressed cushion-like form characteristic of *S. sterile* suggest a conclusion contrary to the molecular data. A more detailed and comprehensive study is required to fully assess the differences between the two species.



This study is designed to examine whether large, external morphological traits are the only differences between these two possible species or whether these differences continue after a detailed examination of internal, microscopic morphological traits occurs. This study will utilize the scanning electron microscope facilities at Oregon State University as well as use light microscopy to provide the first morphological study comparing *S. intermedium* and *S. sterile*. This work will not only greatly enrich the quality of data available for *S. intermedium* and *S. sterile* but also provide accessible photographic examples of the basic characteristic of the entire genus.

California Lichen Society Grants Program

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

Grant Applicants should submit a proposal containing the following information:

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

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

Grant Amounts: This year, CALS offers up to four grants of $1,500-$2,000. Typically grants are awarded to separate individuals, however depending on the quality of the applications and the amount of funding available, the committee maintains the option to disburse funds as appropriate. All grants are partially dependent on member contributions, therefore the amounts of these awards may vary from year to year.

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

How to submit an application: Please email submissions or questions to the committee Chair at grants@californialichens.org **by May 1, 2024** or by **November 1, 2024**. The current Chair is Rikke Reese Næsborg.

CALS bulletin in review: a look back on the last decade

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This year, the Bulletin of the California Lichen Society celebrates its 30th year and I thought it would be fun to take a look back at the last 10 years of issues. As I dove back into the (virtual) stacks I discovered so many great photos and interesting articles.

We've published 531 pages, encompassing 65 articles (not including book reviews, annual meeting reports and grants reports). These articles report on 458 notable species accounts and 3 species nominated for conservation sponsorship. There are numerous checklists from field trips (don't forget to bring these on your next outing!) as well as several beautiful articles on lichen-related art.

Twenty-six taxa are featured in full-length articles- with some being a bit more popular than others. *Ramalina* species top the list, being featured in six articles, closely followed by *Acarospora* species in four articles, and *Physcia* and *Usnea* each in two articles.

All of this is the work of 51 different authors (Table 1), with **Kerry Knudsen** and **Tom Carlberg** as our top contributors. We want to express our gratitude to all of our contributors- without you, we wouldn't have a Bulletin to enjoy. Please keep sending us your photos and articles!

Lastly, a huge thank you to our volunteer editorial and production team- **John Villella**, **Shelly Benson**, **Hanna Mesraty**, **Sarah Minnick**, **Tom Carlberg**, **Justin Shaffer** and **Jes Coyle** have all served as editor (solo or as a team) in the last 10 years, as well as taken shifts wrangling the Bulletin into a beautiful layout. We want to thank our new production editor, **Annie Chen**, who has been with us since the winter 2022 issue. In the coming year we welcome a new co-editor, **Danielle Ward**, to take over as co-editor with Justin Shaffer in the coming year.

With a new website redesign, our past issues are available on the CALS website. Go find them at www.californialichens.org/calsbulletin and see if you can complete the scavenger hunt!

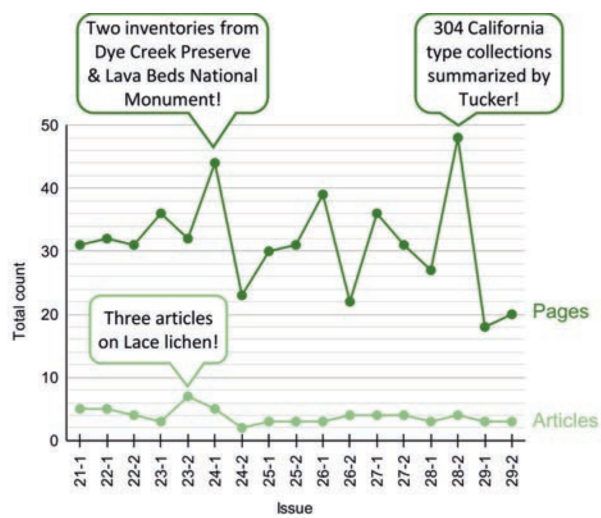


Figure 1. Total number of pages and articles published in each issue of the Bulletin over the last 10 years.

Figure 2: Past bulletin covers featuring artwork by Lucy Martin (left) and Zahra Jarjarmikhayat (right).

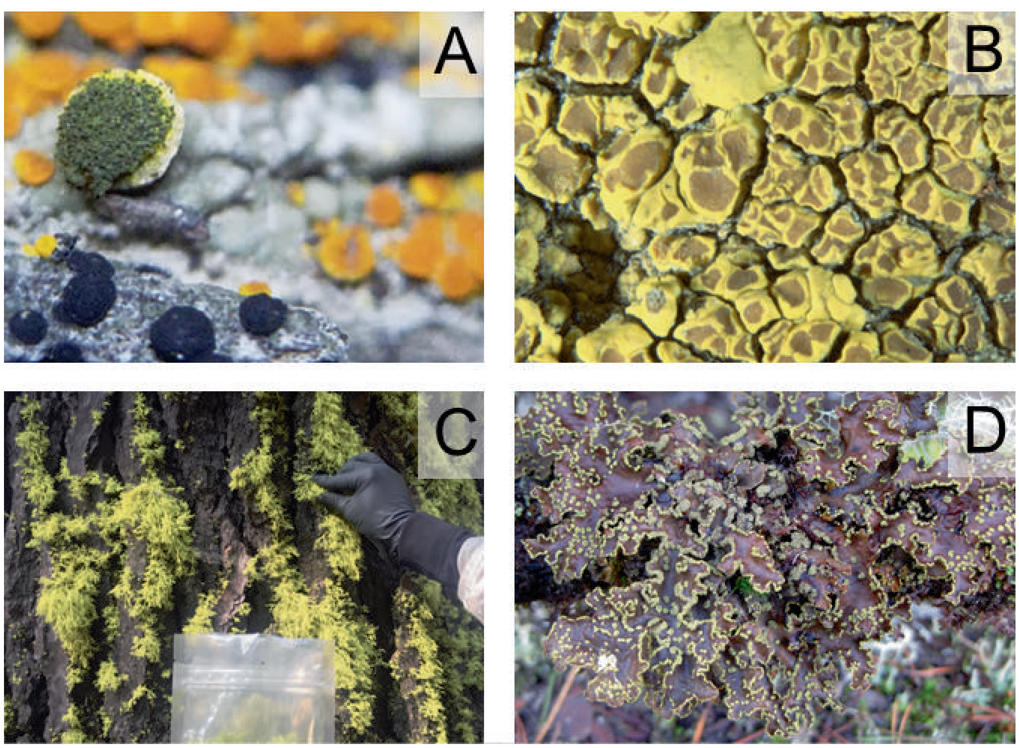
Table 1: Number of articles published by CALS Bulletin authors in the last decade. Apologies in advance for any miscounts.

15	Kerry Knudsen
11	Tom Carlberg
7	Jana Kocourková
5	Jason Hollinger, Ken Kellman
4	John Villella
3	Bruce McCune, Eric Peterson, Jason Dart, Jesse E. D. Miller, Roger Rosentreter, Sarah Minnick, Shelly Benson
2	Cameron Williams, Eva Hodková, Miko Nadel, Rikke Reese Næsborg, Shirley Tucker, Steve Sheehy, Theodore L. Essinger, Tim Wheeler
1	Aaron Sims, Adrienne Kovasi, Alexander Young, Andrea Craig, Anna Götz, Brian Kie Weissbuch, Brianne Palmer, C. Matt Guilliams, Cheryl Beyer, Christoper Adlam, Daphne Stone, Hanna Mesraty, Irene Winston, J. Maliček, Jaia M. Guilliams, James Lendemer, Jennifer Riddell, Jes Coyle, John Brinda, Julene K. Johnson, Ken Clifton, Kevin Ball, Lish Dawn, Malaya J. Guilliams, Nastassja Noell, R. Troy McMullin, Rachel Keuler, Robert Fischer, Roxanne Bittman, Zahra Jajarmikhayat

CALS Bulletin Scavenger Hunt

Can you find the answers to these questions hidden in the last decade of Bulletins?
Answers will be printed in the next issue.

In the last 10 years, which three species has the CALS Conservation committee published sponsorship articles for in the Bulletin?
Who was the first lichenologist to conduct a comprehensive study of California lichens and in which region did they focus their doctoral studies?
In which issue can you read about lichens that tell the tale of the water level at Lake Tahoe?
What species of foliicolous lichen was reported as new to California and North America?
Where might you go to find the rare lichens *Hypogymnia schizidiata* and *Acarospora brattiae* in the wild?
In what year did the Bulletin become fully open access with the most recent issues available online on the CALS website?
What was the first known name given to Lace lichen by the Kawaiisu Native Americans in California?
How many species of macrolichens did Rikke Reese Næsborg & Cameron Williams find in Muir Woods National Monument?
Where has CALS gone for its annual meeting field trips in the last 10 years?
Can you identify these cool yellow lichens?



News and Notes

American Bryological and Lichenological Society, Annual Meeting 2024

ABLS will be meeting with the Botanical Society of America for a joint conference.

Location: West Portsmouth, Ohio
Dates: July 11-14, 2024
Conference website: https://www.abls.org/

President's Address

By Jesse Miller
10 January, 2024

As the days begin to lengthen, the California Lichen Society begins our organization's 30th year. Much has changed in California lichenology over three decades. We have made progress on understanding California lichen diversity, facilitating the conservation of these beautiful organisms, and educating the public about them. There are now books and digital resources like iNaturalist that make lichens more accessible to the public. At the same time, the challenges we face have never been greater. Climate change, habitat loss, and altered wildfire regimes pose increasing threats to lichen diversity. The California Lichen Society has always been driven by the passion of our members, and I am happy to see how strong this passion remains today.

2023 has been good to us. We have continued to hold numerous in-person events across the state. We have finally redesigned our website, thanks to the wizardly efforts of **Sarah Burton** (check it out at californialichens.org). There may be more students studying lichens in California today than at any time in the past, thanks to researcher-mentors such as **Rikke Naesborg** and **Klara Scharnagl**. There is probably more interest in lichens among the public than ever before, thanks in part to the many CALS members who perform outreach to the broader community.

As the new year begins, I am excited to share that we are welcoming a new co-editor of the Bulletin, **Danielle Ward**, who will join current co-editor **Justin Schaffer**. Danielle is a Ph.D. student working with lichens at UC Berkeley; you may remember her excellent presentation at our 2023 meeting at Pt. Reyes. Danielle's passion and intellect are readily observable to anyone who has met her, and we are fortunate to have her assistance with the bulletin. Danielle will replace **Jes Coyle**, who co-edited the bulletin for several years and worked hard to keep production on track during the pandemic, when CALS was otherwise mostly dormant. We are grateful to Jes for all she has done for CALS.

We received an unusually large selection of excellent grant proposals this year. The board has voted to fund all of them—by far the largest grant expenditure we have ever made in a single year. When I started as CALS prez, one of my main goals was to increase funding for our grants program. In an era when many young people can barely afford rent in California, even a small grant can help bring research projects into reach. Few young researchers will stay in science if they can't pay their bills while doing it. And studying lichens is more important than ever, as threats to biodiversity continue to mount. I am grateful to all the members whose generous donations have it possible for us to support the next generation of lichenologists.

We are beginning to regain the members we lost during our period of torpor during the pandemic; 2024 may be the year where we finally rebound to 2020 membership numbers. If you have yet to join our organization, please consider becoming a member to support important lichen research and conservation work. Memberships also make good gifts for just about anyone. It would be interesting to see how your dentist reacts, for example, when you say you are giving them a CALS membership.

This year, we are holding our annual meeting and field trip in SoCal for the first time in years, at the Sedgewick Reserve near Santa Barbara, where we will celebrate the 30th birthday of CALS. We will reflect on the history of our organization and where we are going. As always, it will be a chance to see old friends and make new ones. If you've joined us for the annual meeting, I think you will find it is a fun and welcoming group. Most of our membership is currently in the Bay Area, so it will be exciting to expand our community in the southern part of the state. Please spread the word to your friends and colleagues in the region.
I hope to see you in the field sometime in the year ahead. Thanks for all you do for California lichens.

-Jesse Miller, CALS President

Good times at the Tomales Bay lichen bioblitz, which was organized by the Golden Gate Parks Conservancy (including Kristen Jones, right) and led by CALS president Jesse Miller (center), in Marin County in November 2023. Photo by Mellice Hackett.

California Lichen Society

PO Box 472, Fairfax, California 94978

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

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

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

Find CALS online!

californialichens.org

twitter.com/CALichenS

iNaturalist.org/users/cals

facebook.com/californialichens

Membership dues can be made payable to:

California Lichen Society, PO Box 472, Fairfax, California 94978

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

Contact us via: www.californialichens.org/contact

Board Members of the California Lichen Society
President: Jesse Miller
Vice president: Julene Johnson
Secretary: Lise Peterson
Treasurer: Kathy Faircloth
Members-at-large: Tom Carlberg, Ken Kellman, Jennifer Rycenga

Committees of the California Lichen Society
Conservation: Shelly Benson
Grants: Rikke Reese Næsborg, Chairperson
Sales: Tom Carlberg, Chairperson
Activities and events: vacant
Outreach: Lishka Arata, Chairperson
Bulletin: Danielle Ward, Justin Shaffer, Annie Chen editorcalifornialichens.org@gmail.com
Webmaster: Sarah Burton
Diversity, Equity, Inclusion and Justice (DEIJ): Adrienne Kovasi

The California Lichen Society gathered for its 30th annual meeting and field trip at the UC Sedgwick Reserve near Santa Barbara, California, in January, 2024.