Ozark Lichens – Basic Lichen IDs

For the Northern Arkansas Master Naturalists Program

By Nastassja Noell

Key and species description excerpts by Douglas Ladd from “Ozark Lichens: Enumerating the lichens of the Ozark Highlands of Arkansas, Illinois, Kansas, Missouri, and Oklahoma” April 2018 Draft

Textbook excerpts from “Radical Lichenology” by N. Noell in *Radical Mycology* by Peter McCoy (Chthaeus Press 2016)

Basic Morphological Characters

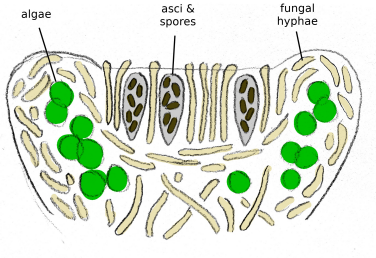
Basic Morphotypes

Fruticose Lichen

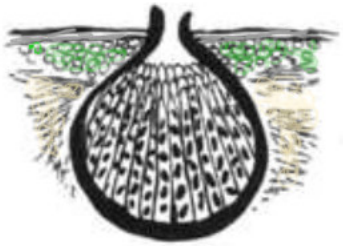
Foliose Lichen

Crustose Lichen

Sexual / Fruiting Body:

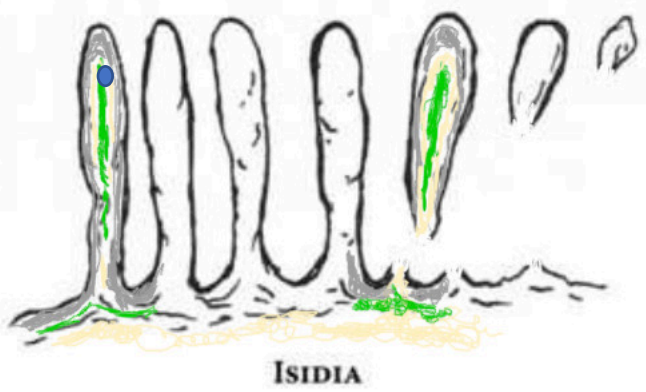


Apothecia



Perithecia with asci filled with sexual ascospores. Pycnidia look similar but contain asexual conidia.

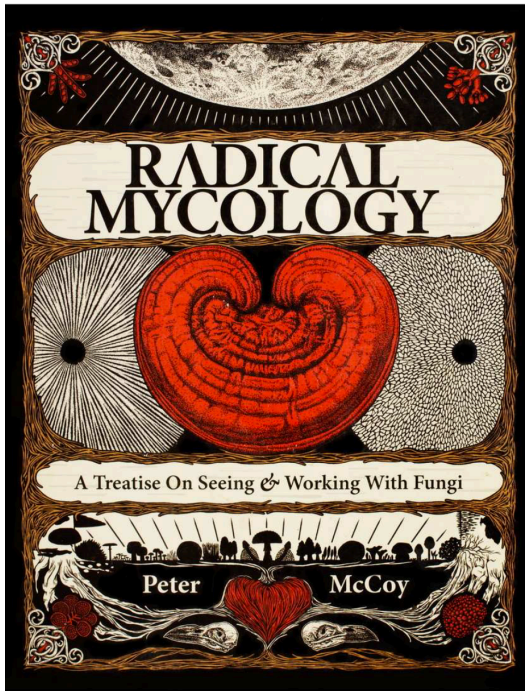
Asexual / Diaspore type:



Key

- Algae or Cyanobacteria
- Medulla (loose hyphae)
- Cortex (dense hyphae)

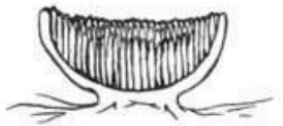
Adapted from “Radical Lichenology” by N. Noell in *Radical Mycology* by Peter McCoy (Chthaeus Press 2016)



Excerpts from “Radical Lichenology” by N. Noell in *Radical Mycology* by Peter McCoy (Chthaeus Press 2016)

The Reproductive Structures of Lichens

Though the algae and fungi in a lichen cohabitate, they do not share DNA. Both organisms reproduce independent of the other and a lichen as a whole may have multiple ways of replicating itself. The mycobiont tends to reproduce much like other fungi—often through the production of sexual spores and/or asexual conidia. The Ascomycete lichenized fungi have sexual reproduction patterns that tend to reflect those of their mushroom-forming kin, especially the Cup Fungi in the order Pezizales. In Ascomycete dominant lichens, the spore producing ascomata are generally apothecia or perithecia. Some Basidiomycete lichens do exist, however these are rare and often mistaken for mushrooms. The fruiting body structure in a Basidiomycete lichen is often similar to an agaric mushroom, however the mycelium and associated green algae form a distinct, superficial vegetative thallus (e.g. the basal scales of *Lichenomphalia hudsoniana*). The exception is the basidiolichen *Dictyonema s.l.* which looks and feels like a polypore mushroom, but the photobiont lives in the interior of the thallus.



Apothecia

5

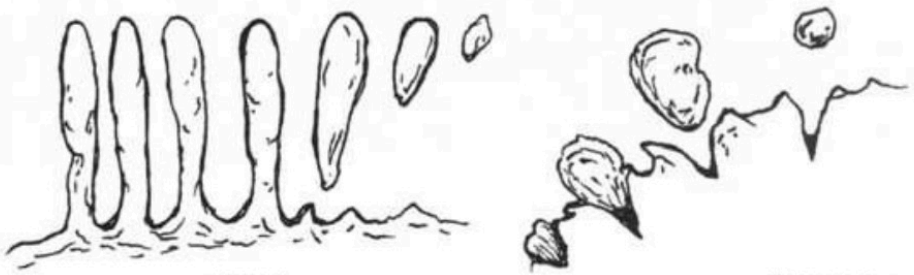
Perithecia with asci filled with sexual ascospores. Pycnidia look similar but contain asexual conidia.

After sporulation by the ascomata or basidiomata, the spores grow independently for a short while until an appropriate photobiont is found. These spores take a variety of shapes, sizes, colors, and form. As with mushrooms, the general spore types are usually consistent across genus or family. Most lichens also have asexual fruiting bodies (*conidiomata*) that produce conidia. In some species, conidia have been found to act as spermatia, fertilizing another lichen through a structure known as *trichogyne*.

Interestingly, most lichens also feature one or several methods for asexual cloning of the lichen itself. Instead of, for example, producing new spores with unique DNA sequences, these lichen clones are little bundles of fungal hyphae containing several photobiont cells. These bundles, called *diaspores*, bud off and fall away or are carried by the wind to new habitats where they serve as “seeds”—cottony clones of the mother lichen—that will eventually grow to be a new thallus. Diaspores can be dispersed hundreds of miles on the feet of traveling birds and in the air currents of the upper atmosphere, or more locally on the backs of insects and animals. Often the diaspores simply fall from the mother lichen to establish on a lower branch or below a host boulder.

When a diaspore lands on a suitable substrate and the right moisture and nutrients are present, it will first grow rhizomorph-like structures over the surface of the substrate. From this structure the thallus’ tissues will begin to grow from the center outwards on top of the substrate, forming the cortices, the medulla, and a layer of photobiont cells. Diaspores come in two main forms:

- **Isidia:** These diaspores grow from within the medulla and push up through the cortex, bending the cortex around the diaspores, forming a protective cortex that then breaks off in finger-like pieces.
- **Soredia:** These diaspores lack any protective cortex. They are granular outgrowths of the medulla that grow up through openings in the cortex called *soralia*.



Isidia **Soredia**

Diaspore-producing lichen species have distinct morphologies that aid in their identification. Lichens that produce isidia will not produce soredia, and vice versa. The diaspore type and location of origin are significant characteristics that likely reflect speciation events in the evolution of a particular group of lichens. Most sorediate and isidiate species will also occasionally still produce viable apothecia (in addition to their usual asexual diaspores), however there are a few species, e.g. *Lepraria spp.*, that have never been observed in the sexual state. Very rarely one will encounter sorediate or isidiate forms of species that normally do not produce diaspores. This terminology might be confusing at first, but just remember that diaspores contain both algal and fungal symbionts and thus reproduce the whole lichen as a clone, while spores reproduce only the mycobiont.

for the forest. Nitrogen is a primary limiting nutrient in most ecosystems.

- **Food Web:** Lichens provide critical winter forage in temperate to boreal forests. Horse-Hair Lichens (*Bryoria spp.*) are the primary winter forage of keystone species including the woodland caribou. A variety of small mammals depend on them for food as well.
- **Insects:** Insect-lichen associations are relatively unknown. Some insects such as Lacewings use lichens as camouflage, but there are likely many more intersections to be discovered.

Fruticose Lichen

Identifying Lichens

Before one can begin to work with lichens, it is essential to be able to first learn how to identify them. Identifying lichens is one of the most rewarding ways of engaging with lichens for it not only enhances personal and ecological resiliency but also increases one's connection to a habitat. As you learn how to identify lichens, more and more species begin to reveal themselves. A forest that previously looked like a wash of only one or two lichens soon turns into an ecosystem covered in hundreds of species.

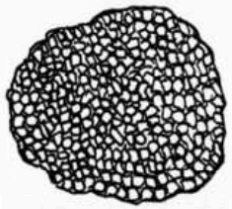
Luckily, learning to identify most of the larger lichens is not too difficult and requires little equipment. If you're an herbalist, a good 10x or 20x loupe, field guide, and practice differentiating between look-alike species is all you will need. If you're an artist and want to collect dye lichens, you'll also need to do spot tests, as described below. If you're a citizen scientist doing environmental monitoring you'll probably also want a dissecting scope in order to identify lots of different species within a shorter period of time. And if you're a naturalist measuring total biodiversity, you'll eventually also want a compound microscope and the chemicals known as P and I.

Identifying lichens first begins with determining the overall structure of the lichen, generally classified by the following three forms:

- **Fruticose:** These lichens have a tree-like or beard-like form and are found in the greatest abundance growing in temperate rainforests. They tend to hang from trees where their large surface area is able to absorb as many nutrients and as much water from the air as possible. In more arid forests or areas with air pollution issues, fruticose lichens are often low in abundance and diversity. Unique features of fruticose lichens include *branches* and a uniform *outer cortex* (no distinction between upper and lower cortex is possible).
- **Foliose:** Foliose lichens are flatter and more leaf-like. They come in a wide range of shapes and sizes and are often found in the greatest abundance in moist temperate forests on the bark and branches of trees and on top of moss at the bases of trees or rocks. Most are attached to the substrate by *rhizines* (short root-like structures) and the thallus usually forms a *rosette* (rose shapes), where each section is called a *lobe*. Lobes can be elongated like fingers or squat like rose petals. Lobes that are smaller than 2 millimeters in length are called *squamules*; lichens with many squamules are called *squamulose*. Unique features of foliose lichens include lobes, differentiated upper and lower cortices (usually both are present) and rhizines.
- **Crustose:** These lichens are the most diverse group of lichens. They are found growing in all habitats, from the bark in tropical rainforests to the soil of arid deserts to frigid rocks in Antarctica. These lichens grow along or within the surface of their substrate, forming a living skin that facilitates water absorption and erosion prevention in desert habitats while also providing an anti-herbivory shield for thin barked trees in temperate and tropical forests. Unique features of crustose lichens include an upper cortex (no lower cortex) and *areoles* (the tile-like subunits making up the thallus of many crustose lichens).

Foliose Lichen

Rhizines



Crustose Lichen

The Lichen Rainbow

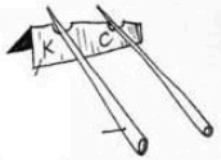
Are lichenologists colorblind? Sometimes it sure seems like it! Describing the colors of lichens for identification purposes is a highly subjective, and rather contentious topic among both amateurs and professionals. Is a lichen containing usnic acid called yellow, or yellow-green, or pale green? Ask three lichenologists and you might get three different answers. Similarly, a lichen containing the compound atranorin may be called blue by one person or white by another. It's all a bit ridiculous, but the matter is more confounded by the fact that lichen colors tend to vary when they are wet, dry, shaded, or exposed to the sun. Thus, some tips are offered to aid in determining a lichen's color:

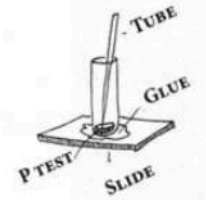
- Try to ID lichens only when they are dry. This is when their pigments are most visible and consistent.
- Learn to recognize lichen pigments instead of colors. Begin associating the color you see with the chemical produced by the lichen, that way you can learn the range of color variation of "usnic green," "atranorin gray," etc.
- When collecting lichens remember to note if the lichen was in a shaded location – lichens exposed to less sunlight produce less pigment and are thus more pale or almost green colored.

Spot Tests

As with identifying mushrooms, proper identification of a lichen may require the use of color change-inducing chemical reagents. This process is slightly different from that of working with mushrooms, but with some practice it can often be done quickly in the field. The materials for spot tests include:

- **2-4 small glass containers:** These are for holding the chemicals. I prefer glass tincture bottles with eyedroppers that seal at the top.
- **Chemical application device:** I prefer glass capillary tubes, others use a dissecting probe. Eyedroppers apply too much chemical, producing inaccurate reactions.
- **Razor blade**
- **Dissecting microscope or large magnifying glass**
- **Chemicals:** The most commonly used chemicals for lichen identification are K (10% potassium hydroxide KOH) and C (normal household bleach). As you get more comfortable with lichen identification you will want to add E (ethanol or methanol at 70% or higher), P (*p*-Phenylenediamine), and I (Lugols iodine) to your repertoire.
- **UV lamp:** Centered on 350 nm (see below).





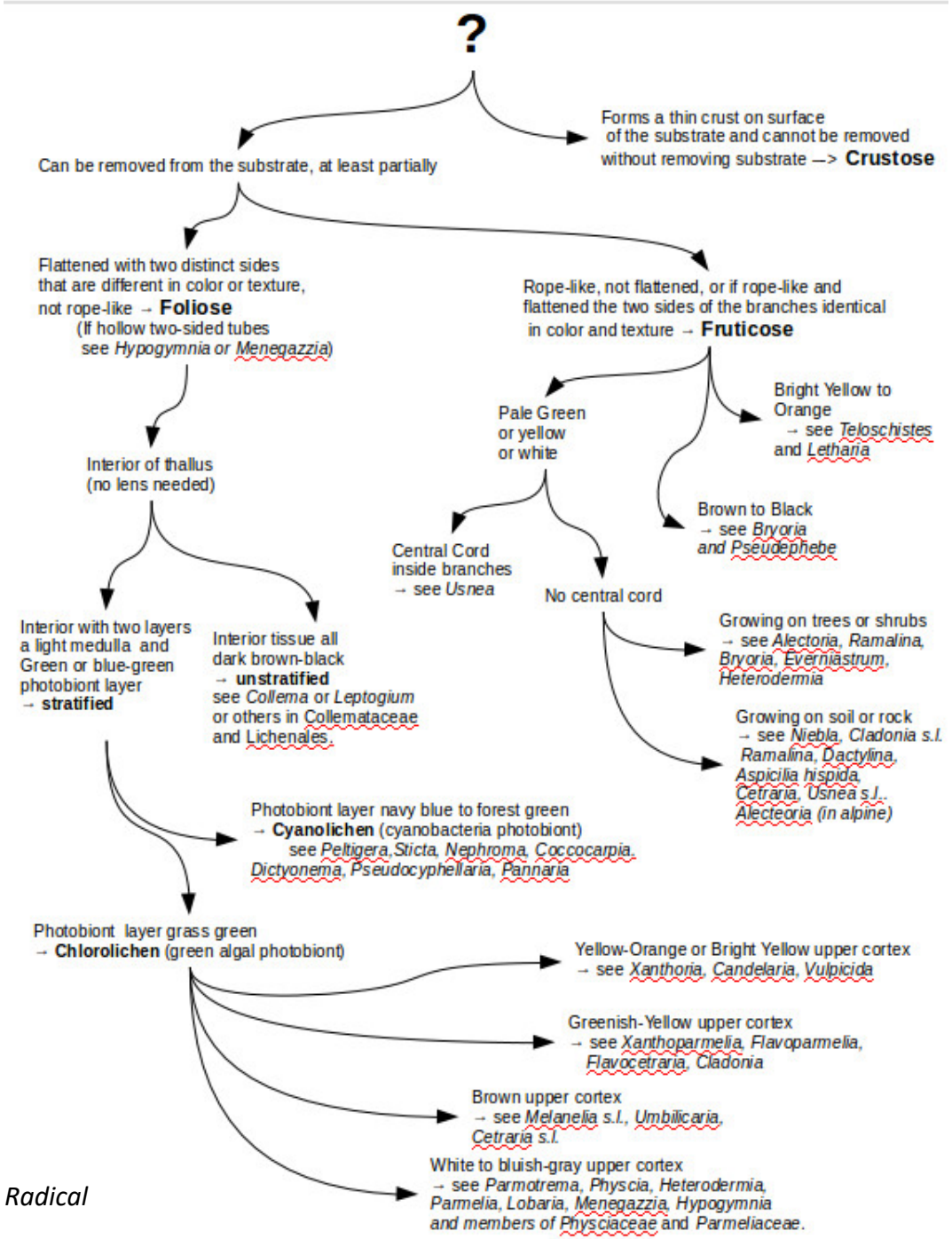
Spot test gear

Spot tests often need to be applied to both the cortex and the medulla of the lichen, and often in a specific order, so make sure the capillary tubes are specific to only one chemical. I accomplish this by making my K tube longer than my C tube since KOH is more commonly called for in most ID keys. To limit having the toxic P test rolling around, I make the P tube so long that it rests in the P mixing container.

A UV lamp is also important for identifying lichens in tropical or subtropical areas, less so in temperate areas. Tropical lichens often contain xanthones, subtle yellowish pigments that fluoresce under UV light. UV lamps are also useful for other groups of lichens, including *Cladonia* and *Parmotrema*. The lamp must emit UV with a wavelength of around 350 nm in order for most UV+ substances to fluoresce. Cheap UV LED flashlights do not work! Some experimentation may be required to find a suitable lamp.[16] To conduct a UV spot test, simply go into a dark closet or cut holes out of a cardboard box for your eyes and hands, and turn on the UV lamp being careful not to damage your eyes. If the lichen cortex has xanthones it will fluoresce as a dull to bright orange or yellow color. If the lichen contains alectoronic acid or other subtler medullary chemicals, you will need to first flake off some of the cortex to expose the medulla before conducting the UV test. Alectoronic acid and other medullary chemicals turn a subtle to bright white or "ice blue" under UV, depending on the concentration. This can be a confusing spot test if the results are not obvious, just know that a dull or vibrant purple color indicates a negative UV reaction.

My preferred capillary tubes are made by Fisher Scientific (70ul, product number 22-260-943). You can get 100 for ten bucks. Before you use one, first create a narrow application point by holding the middle of the glass capillary tube over a small flame until the glass is soft. Then pull from opposite ends to break the tube at the center. Using sand paper or a rough surface, gently rub the narrow tip until there is a small hole. The capillary tube will pull chemicals up inside using capillary force and will pour them onto the lichen when the tip touches the thallus.

Excerpts from "Radical Lichenology" by N. Noell in *Radical Mycology* by Peter McCoy (Chthaeus Press 2016)



Excerpts from “Radical Lichenology” by N. Noell in *Radical Mycology* by Peter McCoy (Chthaeus Press 2016)

#1

Photo Credits from Left to Right: Troy McMullen; Grove Museum; Jason Hollinger

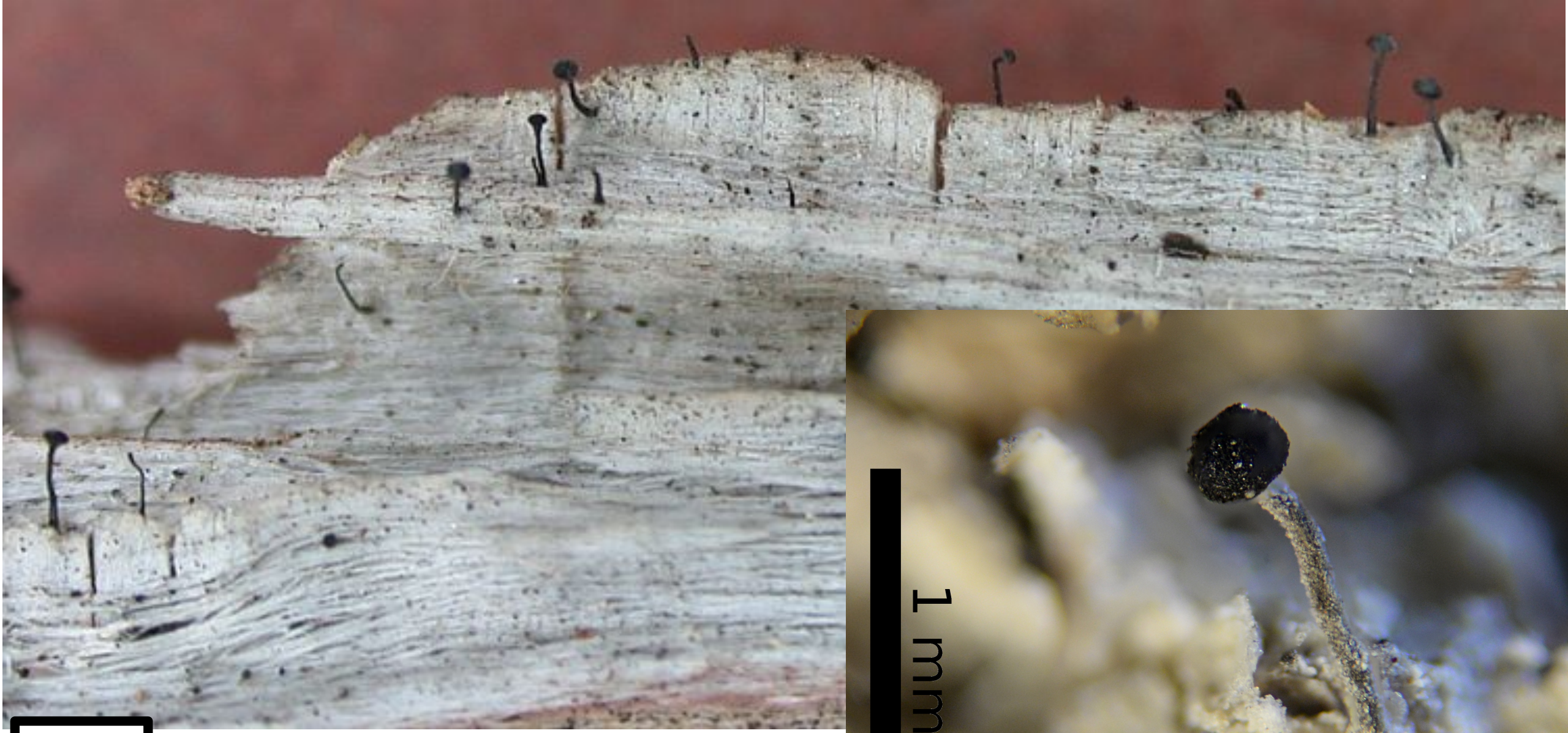
#2

Wet

Dry

Underside

Photos by Jason Hollinger



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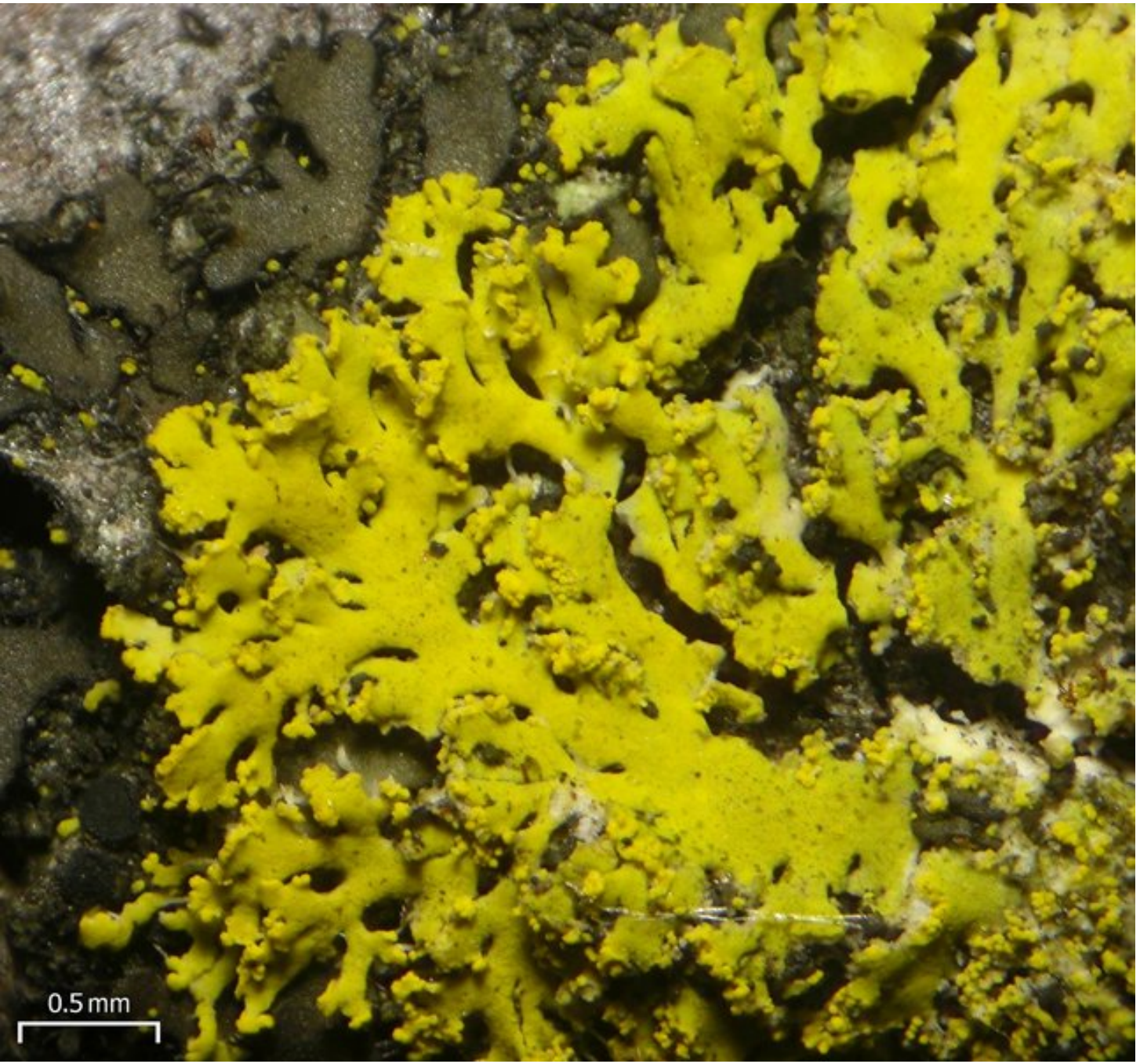
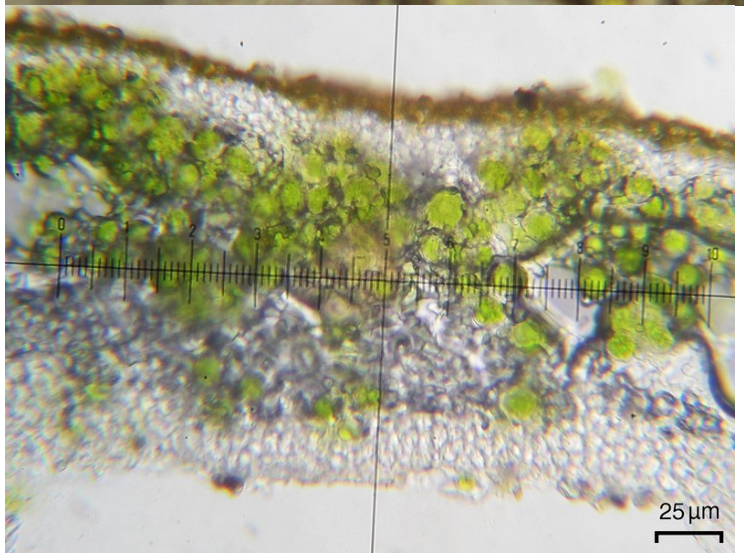
Photos by Andre Aptroot and Melechin AV





Photos by Jason Hollinger

#4

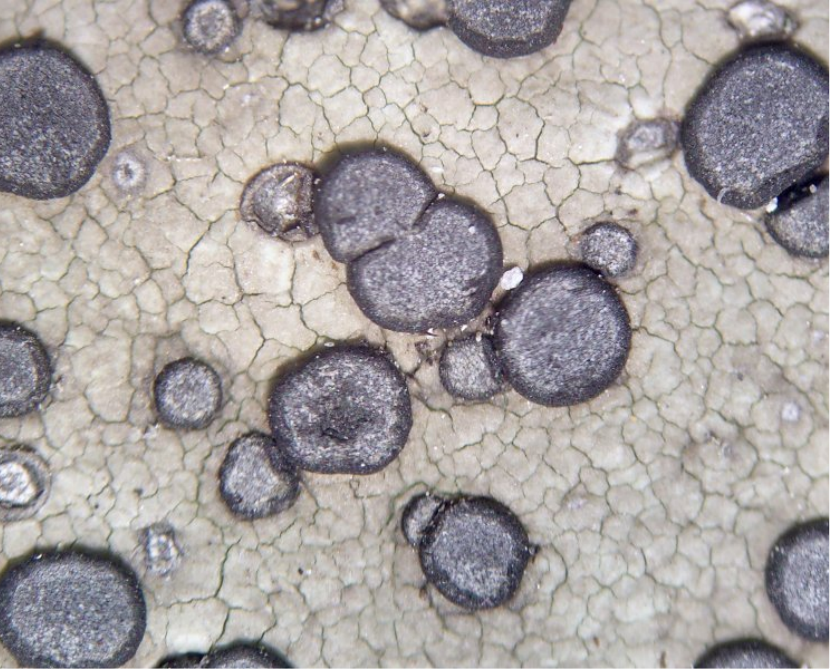
#5

Photo by Frank Bungartz

#6

Photo by Jason Hollinger


Wet
Dry
#7
Photos by Jason Hollinger



#8

Photos by Jason Hollinger

Wet

Dry

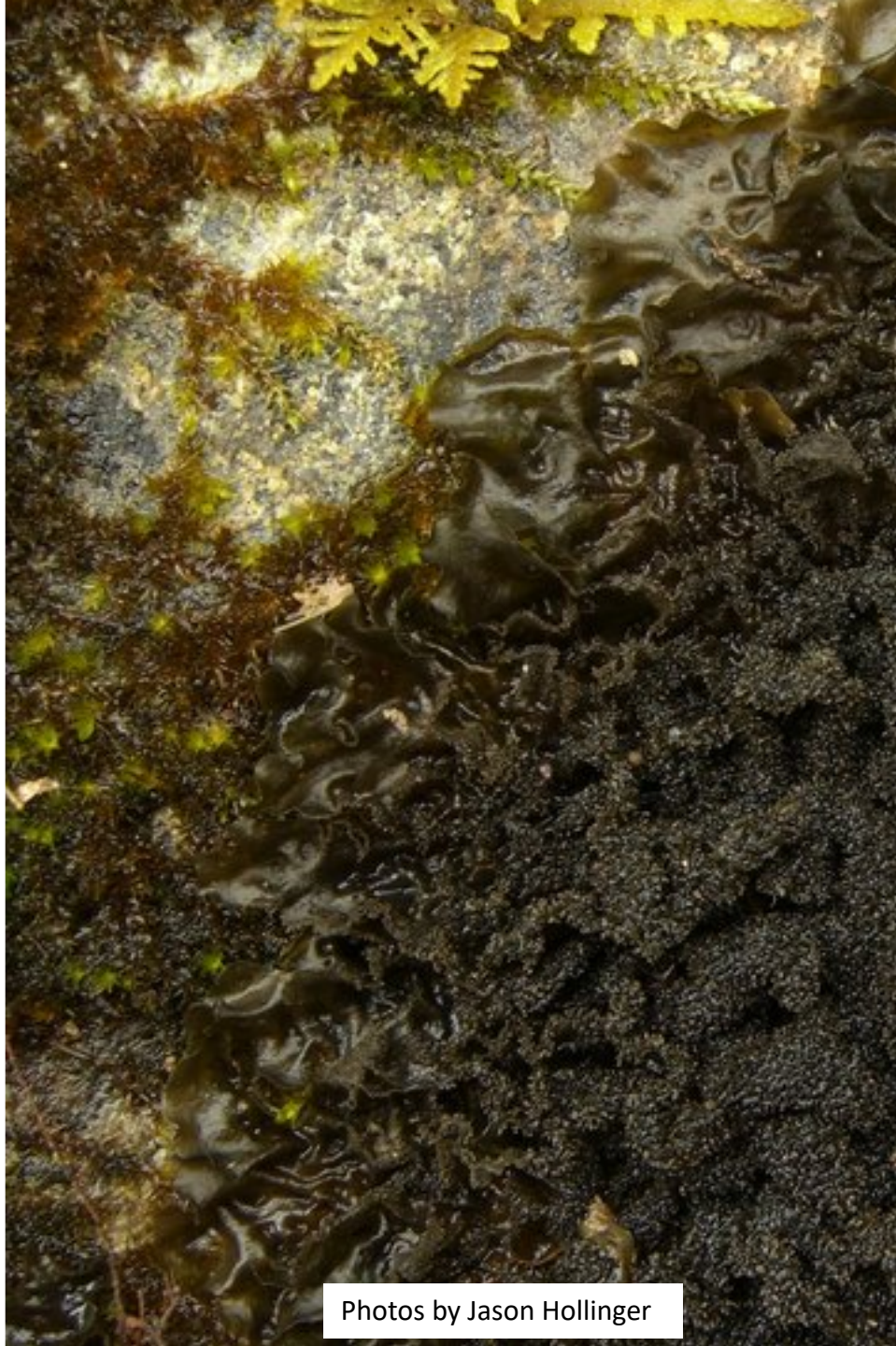
#9

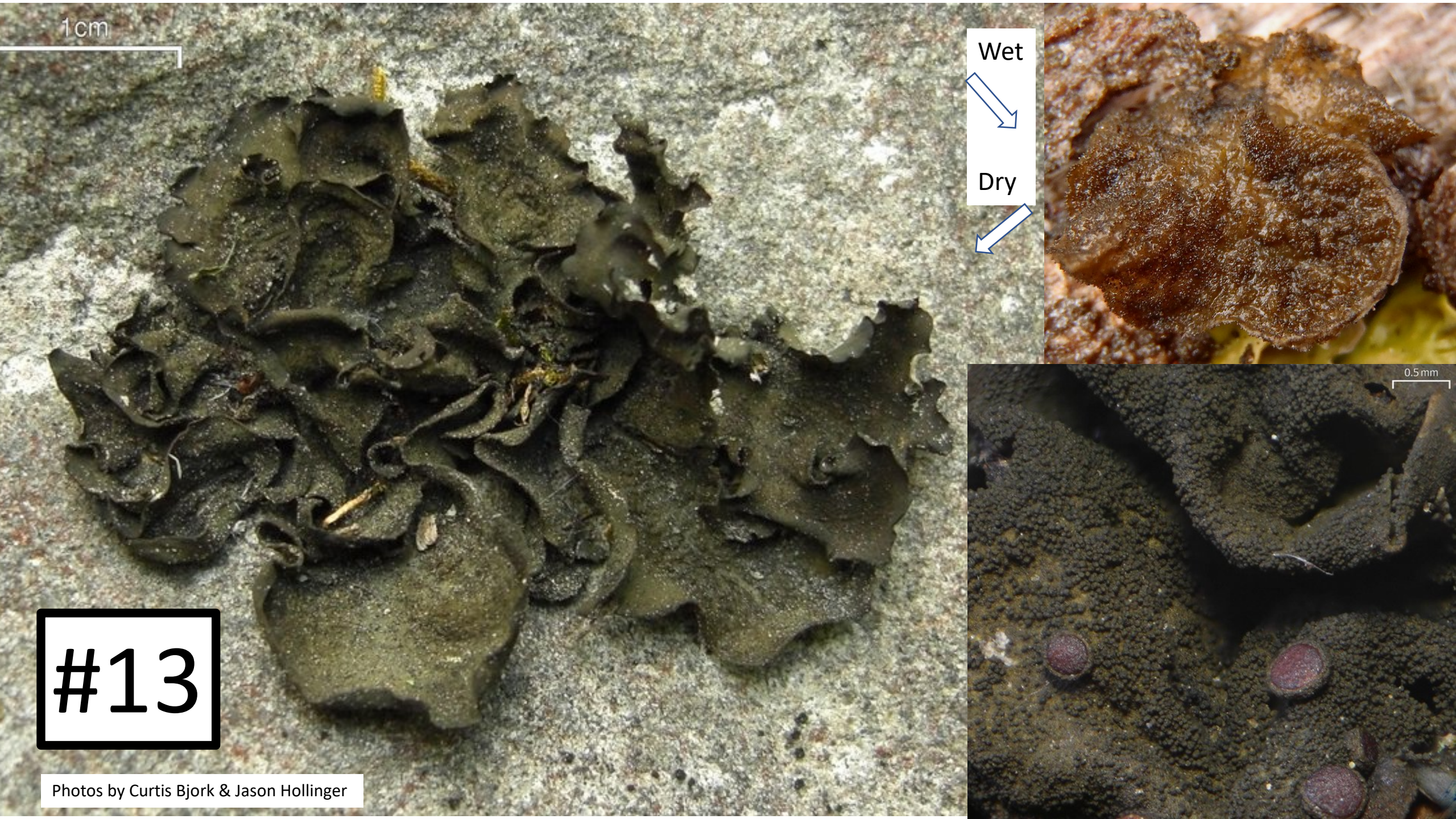
Photos by Curtis Bjork & Chris Parrish

#11

Photos by Jason Hollinger


#12
5 mm


Photos by Jason Hollinger


1cm
Wet
Dry
0.5mm
#13
Photos by Curtis Bjork & Jason Hollinger

#14

Photos by Chris Parrish & Lisa Delacroix

#15

Photos by Curtis Bjork
& Jason Hollinger

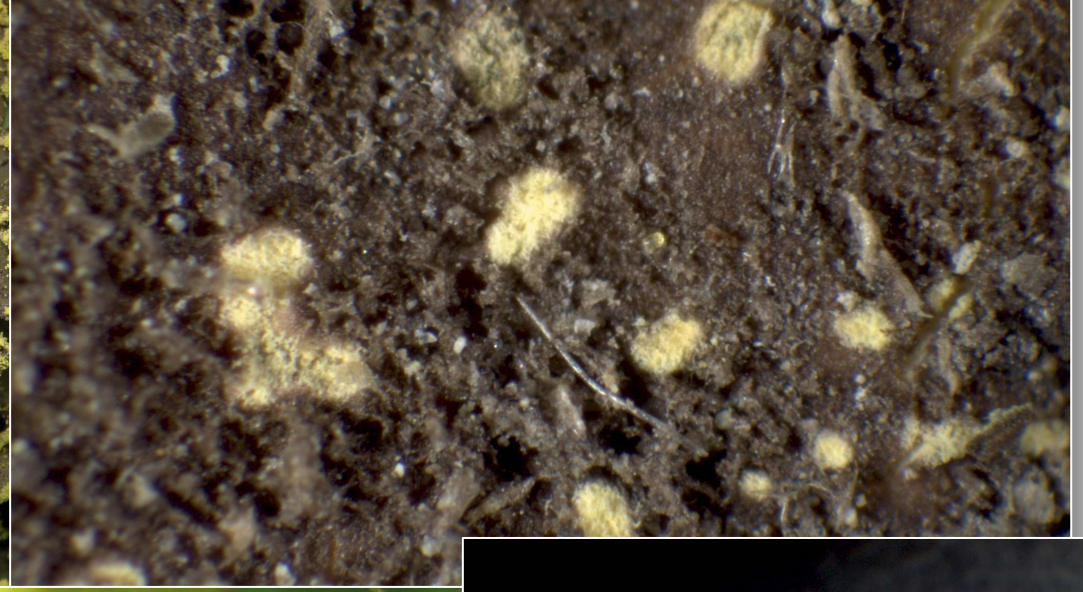
#16

Photos by
Andrew Khitsun
& Jon Kolbert

Photos by Troy McMullin & Jason Hollinger

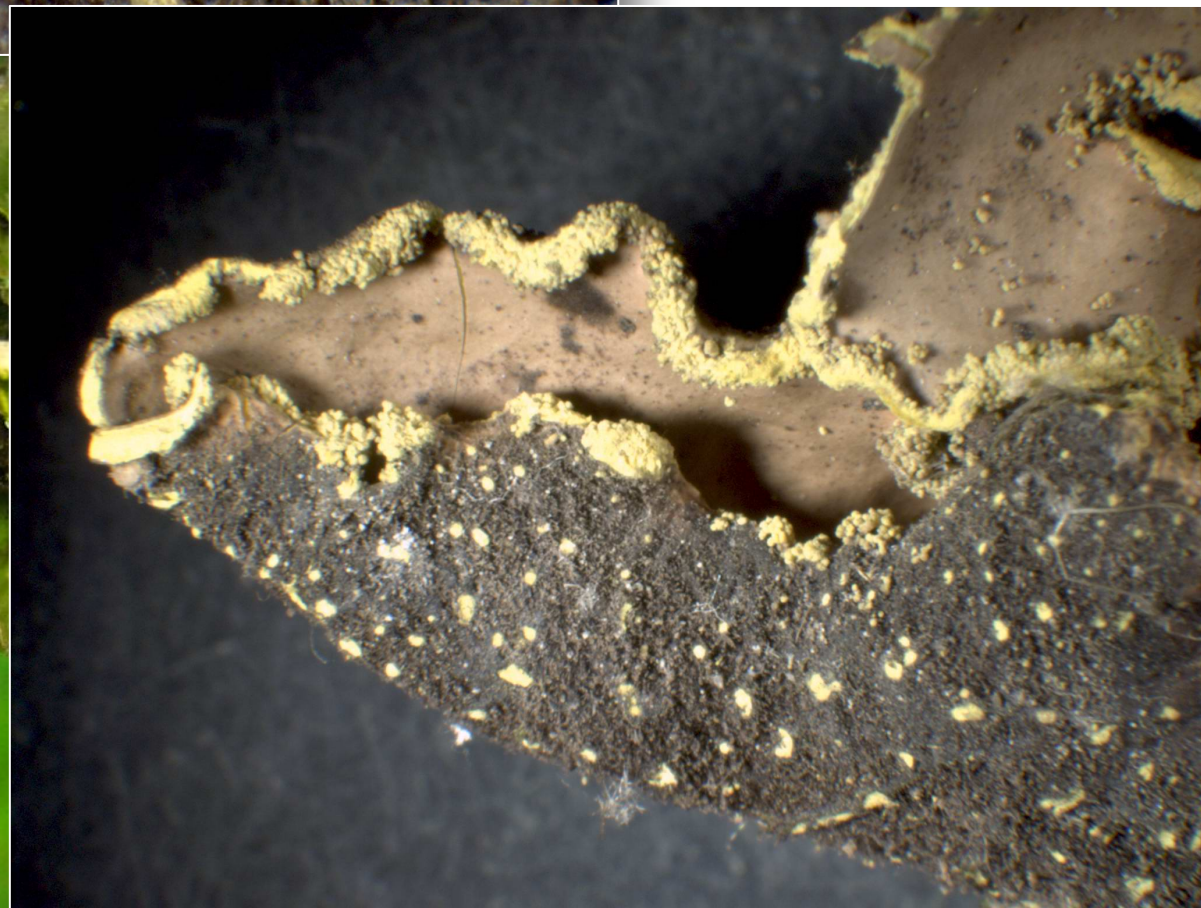
Photos by Jason Hollinger

#18



#19

Photos by P.L. Nimis, Stridvall & Jason Hollinger



Photos by Jason Hollinger & Chris Parrish

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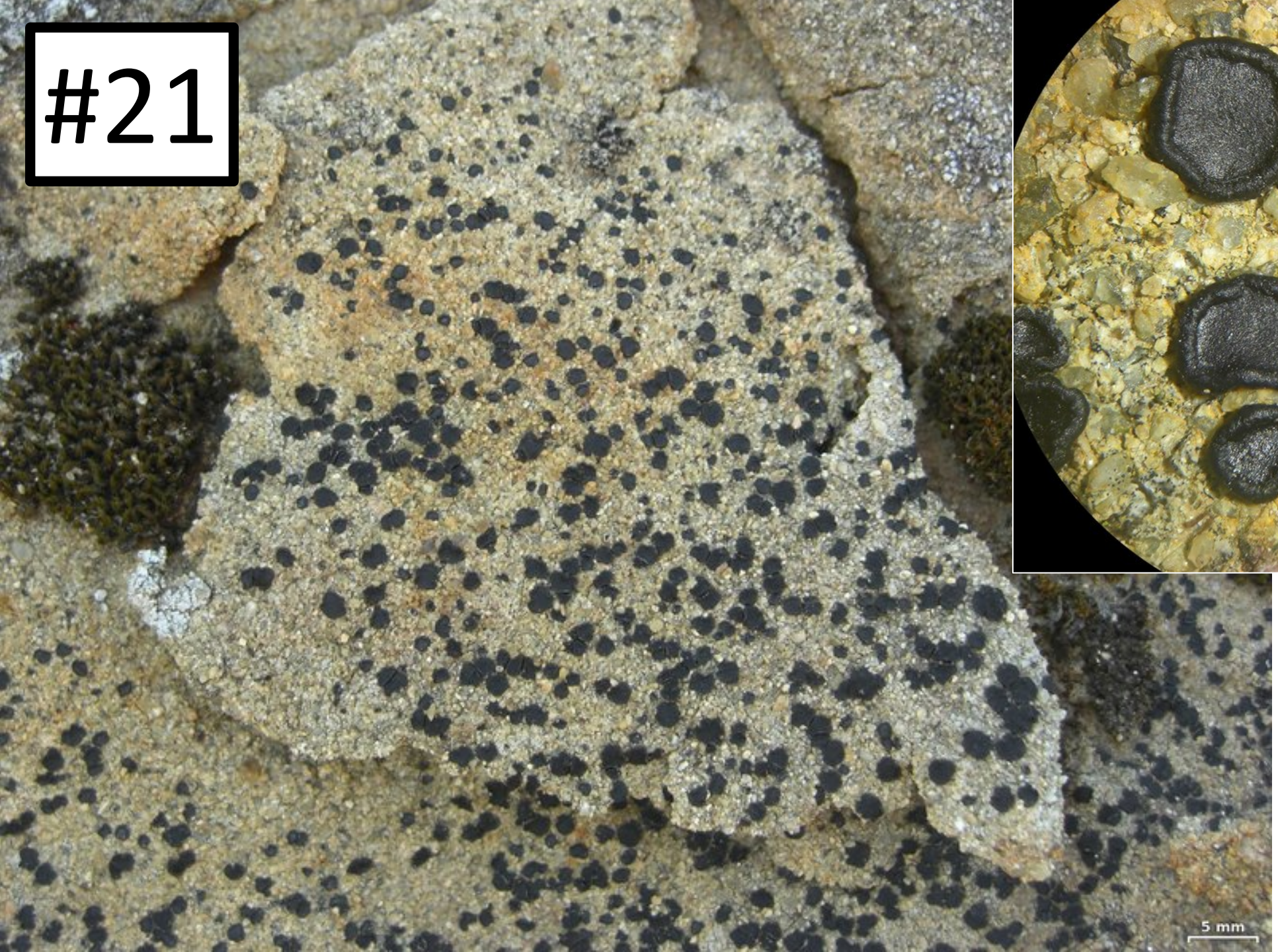
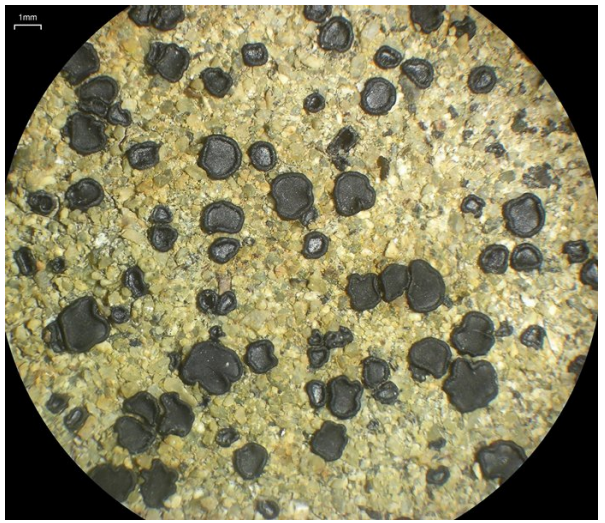
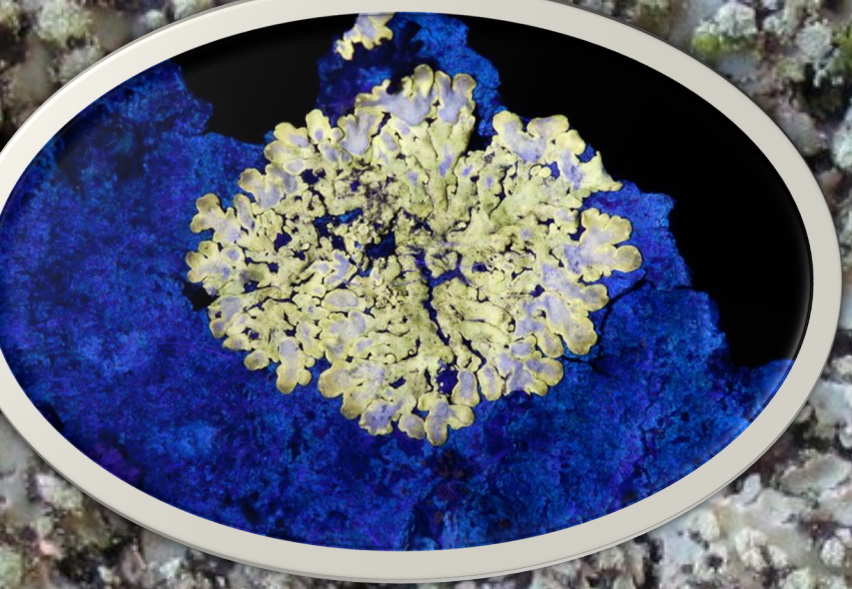




Photos by Jason Hollinger



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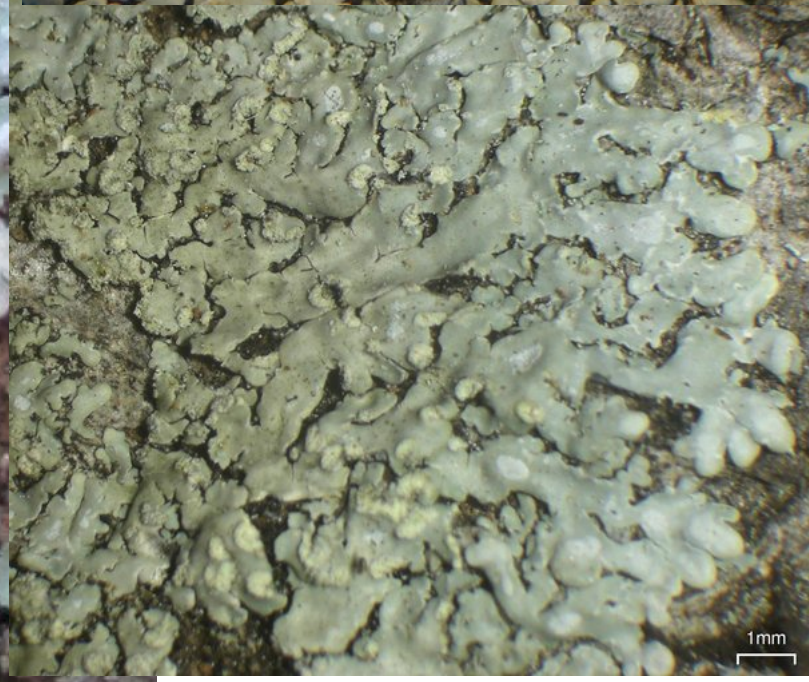
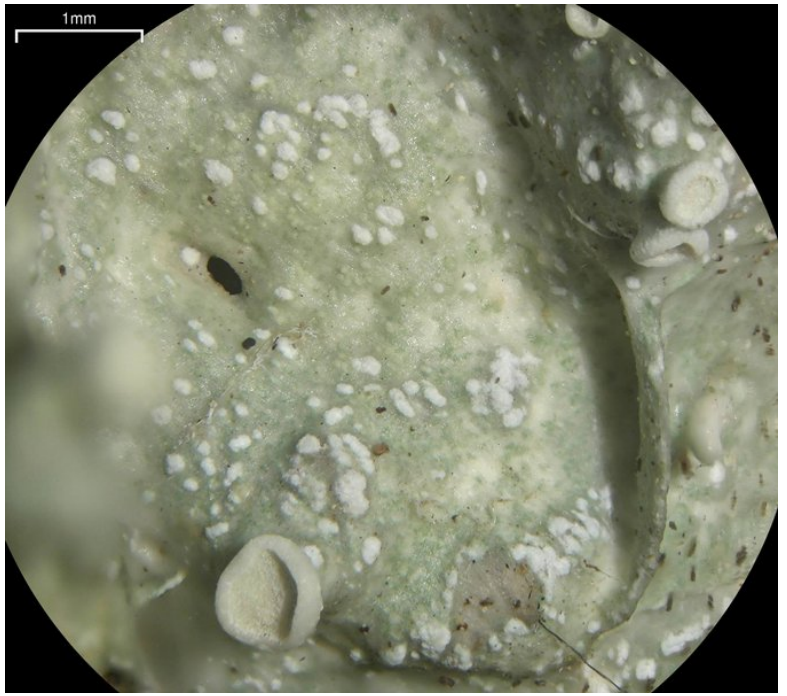


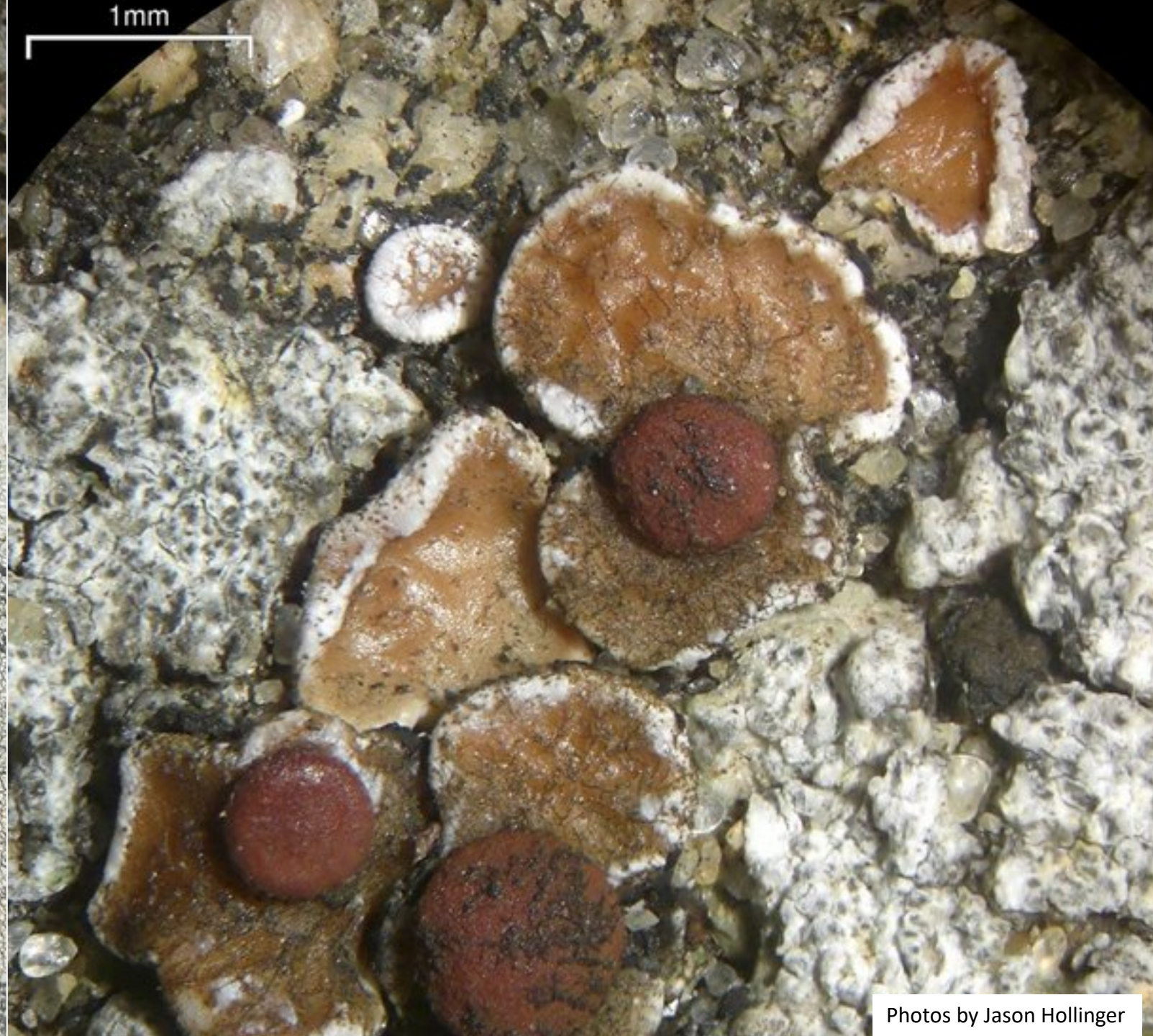
Photos by Troy McMullin, Chris Parris & Jason Hollinger



#23

Photos by Jason Hollinger

#24



Photos by Jason Hollinger

#25

Photos by Jason Hollinger

#26

Photos by Jason Hollinger & Troy McMullin

#27

Photos by Jason Hollinger & Troy McMullin

#28

Photos by Jason Hollinger

#29

1 cm

Photos by Jason Hollinger


1mm
3 mm
#30
1mm
Photos by Jason Hollinger

#31

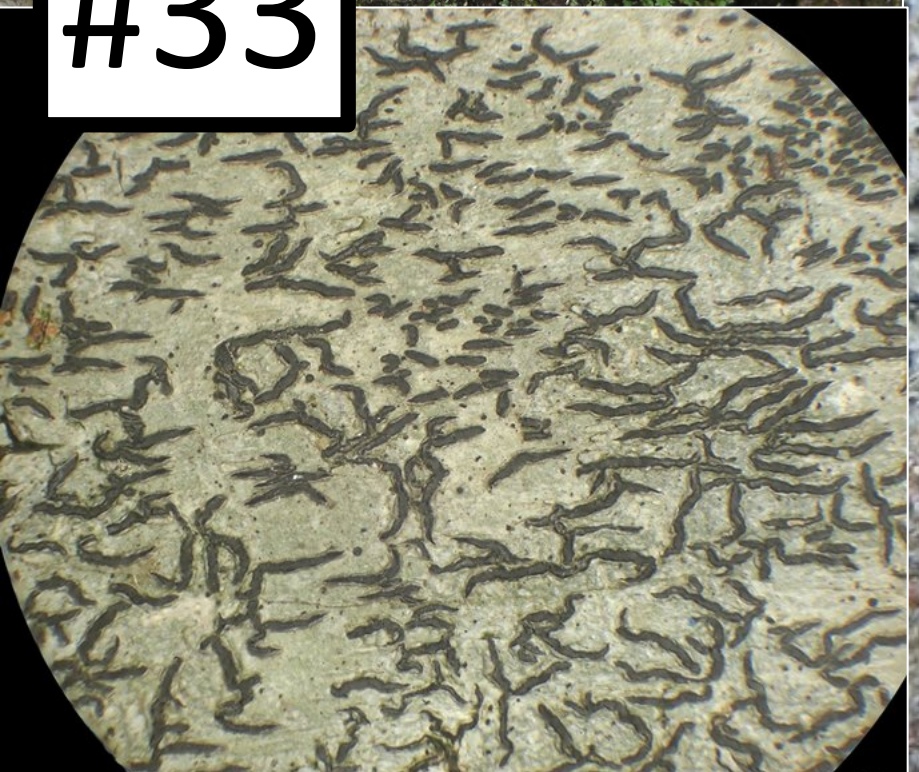
Photos by Jason Hollinger

#32

Photos by Jason Hollinger

5 mm

#33



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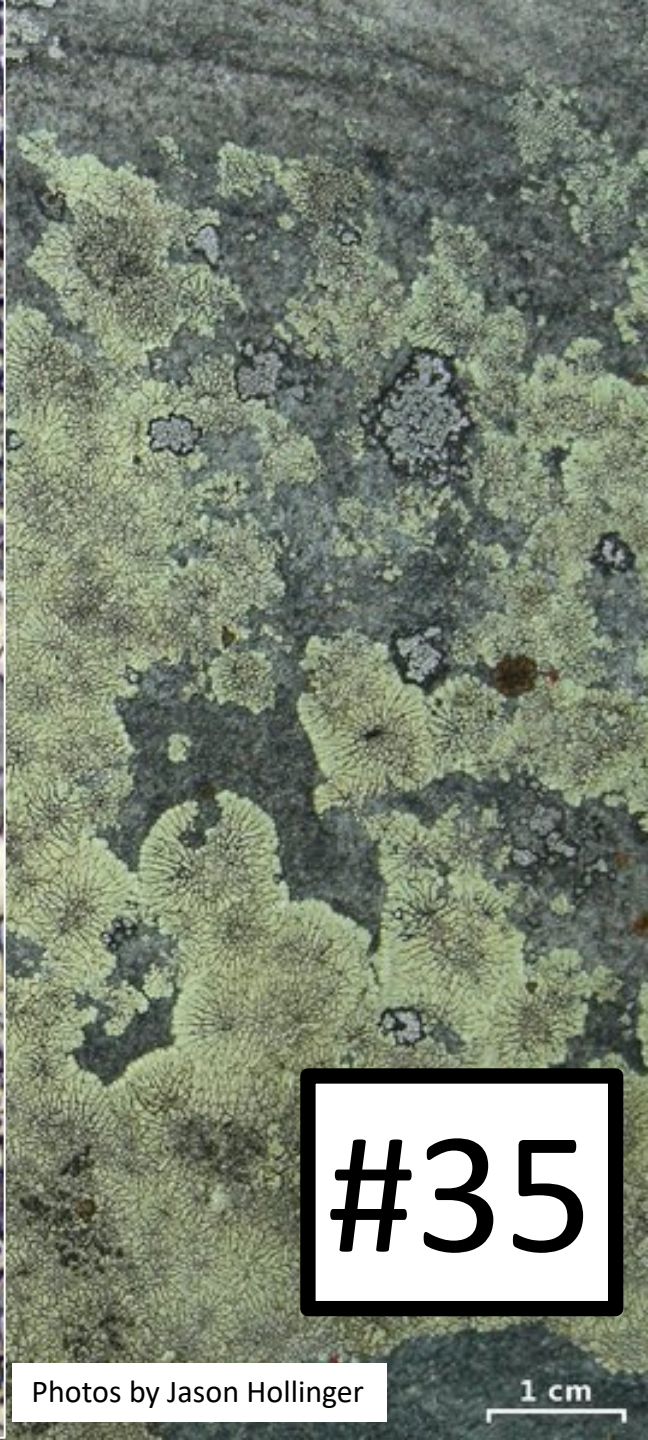
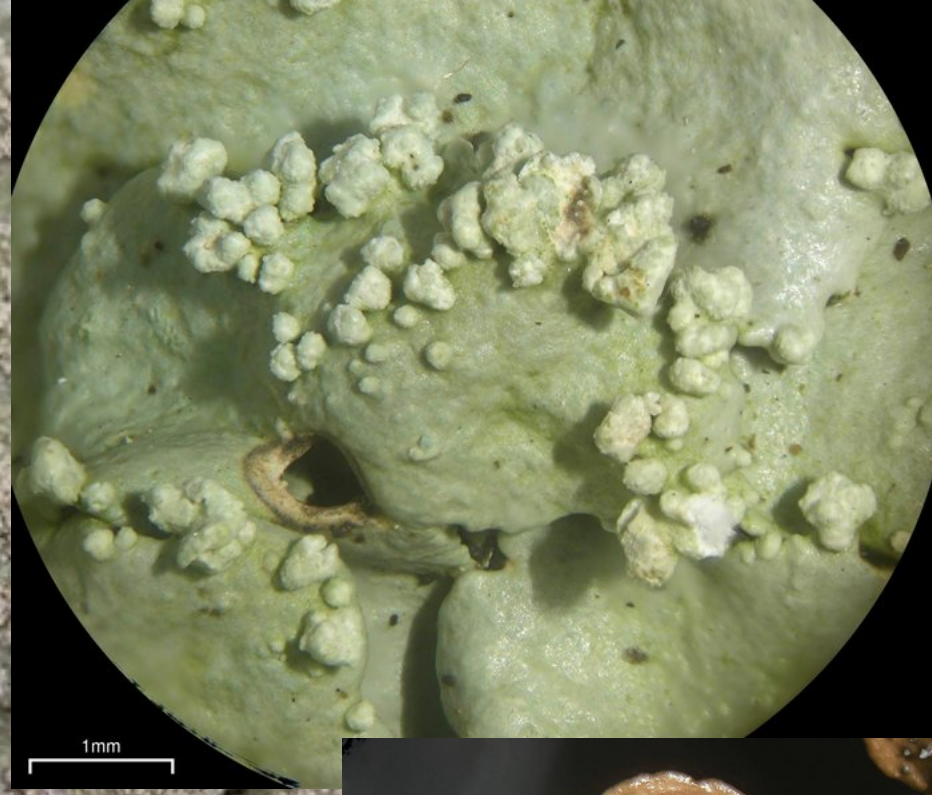
1mm
#34
Photos by Jason Hollinger


#35
Photos by Jason Hollinger
1 cm

#36



Photos by Jason Hollinger

#37

Photos by Jason Hollinger


#38
1 cm
Photos by Jason Hollinger

KEY TO SECTIONS

1a. Thallus fruticose, in form resembling an erect to pendent shrub, rope, stalk, or strap, with round to flattened branches, generally lacking a distinct lower cortex that is differentiated from the upper cortex.....**KEY A fruticose lichens**
1b. Thallus crustose, foliose, or squamulose, usually flattened, either closely attached to the substrate or with a distinct lower cortex, or flattened, lobe-like, and ± adnate to the substrate..... 2

2a. Thallus foliose to squamulose, of ± flattened, typically horizontally spreading, distinct lobes, often with a distinct lower cortex; upper & lower surfaces usually different in color and/or structure; rhizines or tomentum often present..... 3

3a. Thallus foliose, typically of branched, radiating lobes or rosettes .... **KEY B foliose lichens**
3b. Thallus squamulose, of numerous scattered to contiguous, discrete, often unlobed, squamules .....**KEY C squamulose lichens**

2b. Thallus crustose, usually closely adherent to the substrate and often nearly inseparable from it; lower cortex lacking; rhizines and tomentum absent 4

4a. Thallus routinely sterile, even in well developed specimens **KEY D sterile crusts**
4b. Thallus fertile, producing ascomata with asci and, usually, ascospores..... 5

5a. Ascomata on distinct stalks, or slender, stalk-like structures (hyphophores) present .....**KEY E Calicialian lichens**
5b. Ascomata sessile to immersed; hyphophores lacking 6
6a. Ascomata perithecia or perithecia-like, ± globose and opening by a typically apical pore, the perithecia sometimes closely aggregated.....**KEY F peritheciate crusts**
6b. Ascomata clearly apothecia, the disk circular to elongate or branched 7

7a. Apothecia elongate or branched, lirelliform to stellate, typically at least twice as long as wide ..... **KEY G lirelliform crusts**
7b. Apothecia ± circular, sometimes slightly irregular or substellate in outline, but prevailingly isodiametric to less than twice as long as wide.. **KEY H crusts with round apothecia**

Keys by Douglass Ladd in ***OZARK LICHENS :*** *Enumerating the lichens of the Ozark Highlands of Arkansas, Illinois, Kansas, Missouri, and Oklahoma; April 2018 Draft [revised and expanded from October 2005 draft*]

KEY A: FRUTICOSE LICHENS (including submacroscopic filamentous taxa)

1a. Thallus flattened to terete, not filamentous, the main branches > 0.3 mm broad. 2
1b. Thallus filamentous, the main branches < 0.2 mm broad 11
2a. Thallus greenish gray to blue-gray, green, or grayish orange, not gelatinous; stratified with a distinct algal layer; largest branches >0.5 mm wide; photobiont *Trebouxia* 3
3a. Thallus branches flattened, not terete.....4
4a. Thallus grayish to orange, at least locally K+ magenta (parietin); usnic acid absent.....*Teloschistes chrysophthalmus*
4b Thallus greenish, K-, usnic acid present.....*Ramalina*
3b. Thallus branches thicker, subterete to terete 5
5a. Thallus branches solid, not hollow.....6
6a. Thallus branches angular; medulla loose and cottony; fibrils absent ..... *Evernia mesomorpha*
6b. Thallus branches terete, with a distinct central cord; fibrils present..... *Usnea*
5b. Thallus branches hollow.....7
7a. Squamules often present; persistent granular primary thallus lacking; podetia and substrate various .....*Cladonia*
7b. Squamules absent; persistent granular primary thallus evident; podetia gray, to 7 mm tall, dark-tipped; on exposed sandstone..... *Pycnothelia papillaria*
2b. Thallus black to dark olive brown, becoming gelatinous when wet, or threadlike and 0.2 mm wide; not stratified with a distinct algal layer; photobiont cyanobacteria or *Trentepohlia* .8
8a. Isidiate; main thallus branches >2 mm wide, black, sometimes pruinose, flattened, umbilicate to straplike.....9
9a. Thallus black, not pruinose, typically subumbilicate; wet thallus <250 µm thick .... *Lichinella*
9b. Thallus grayish, usually pruinose, typically of suberect straplike lobes; wet thallus >250 µm thick.....*Thyrea confusa*
8b. Isidia absent; main branches <2 mm wide, brownish to black, never pruinose, ± terete.....10
10a. On exposed carbonate rocks; thallus branches swollen; photobiont *Gleocapsa*.....*Synalissa symphorea*
10b. On or near bases of mature hardwoods in woodlands; thallus branches ± slender; photobiont *Nostoc* ..... *Dendriscocaulon intricatulum*
11a. Thallus pale green, the branches < 0.02 mm thick; known only from low light conditions inside a dolomite cave (extinct?) ..... *Coenogonium missouriense*
11b. Thallus black, some branches > 0.02 mm thick; widespread on siliceous substrates 12
12a. Thallus a felty mat of elongate, remotely branched, terete filaments < 0.02 mm diameter, some branches >1 mm long; thallus of fungal hyphae closely enveloping filaments of *Trentepohlia*..... *Cystocoleus ebeneus*
12b. Thallus squat, subfruticose, branched, > 0.05 mm diameter, branches < 0.3 mm long; photobiont a cyanobacterium; on exposed siliceous substrates, typically associated with *Psorula rufonigra*.....*Spilonema revertens*

KEY B: FOLIOSE LICHENS

B1

1a. Thallus gelatinous when wet, black to dark slate gray or brown, lacking a distinct algal layer, upper and lower surfaces similar; photobiont cyanobacterial.....2
2a. Thallus distinctly foliose, attached to the substrate at multiple locations, ± horizontally spreading and appressed to substrate 3
3a. Lobes extremely narrow, < 0.2 mm broad ..... *Placynthium*
3b. Lobes > 0.2 mm broad 4
4a. Thallus dull above, black to brownish or olive; upper surface composed of loosely aggregated hyphae.....5
5a. Thallus distinctly foliose; ascospores 1+ septate; asci with IKI+ blue apical dome... *Collema*
5b. Thallus subcrustose, thin and membranaceous; ascospores simple; asci IKI-.....*Lempholemma polyanthes*
4b. Thallus sublustrous above, slate gray to rich brown, upper surface composed of a layer of ± isodiametric cells..... *Leptogium*
2a. Thallus subfruticose to squamulose, typically attached to the substrate at a single point, ascending to umbilicate.....6
6a. Thallus of small subterete branches < 0.6 mm wide.....*Synalissa symphorea*
6b. Thallus of flattened straplike to umbilicate lobes mostly > 1 mm wide 7
7a. Thallus of grayish pruinose ± straplike lobes.....*Thyrea confusa*
7b. Thallus epruinose, umbilicate to broadly squamulose ..... *Lichinella nigritella*

1b. Thallus not gelatinous, variously colored, with a distinct algal layer, upper and lower surfaces usually different colors; photobiont various 8
8a. Upper cortex tinted with orange or yellow, ranging from yellow green or **sea green** to lemon yellow or orange.....9
9a. Upper cortex golden yellow to orange, K+ magenta (parietin).....10
10a. Thallus esorediate, closely adnate; rhizines lacking (simple hapters sometimes present) ...11
11a. Thallus bright orange, distinctly foliose; pruina, if present, inconspicuous; lower cortex present..*Xanthoria elegans*

11b. Thallus bright to pinkish or yellowish orange; often whitish pruinose; lower cortex absent..... *Caloplaca*
10b. Thallus sorediate, appressed to suberect; rhizines present .....*Xanthomendoza*
9b. Upper cortex lemon yellow to yellowish green or sea green, K- 12
12a. Upper cortex lemon yellow (sometimes greenish yellow in extremely shaded populations); lower cortex pale, rhizinate; thallus lobes < 0.4 mm wide..... *Candelaria*
12b. Upper cortex yellowish green; lower cortex various, but if thallus lobes < 0.5 mm wide then thallus subcrustose and lower cortex lacking rhizines.....13
13a. Thallus subcrustose to squamulose-umbilicate, either of discrete, bullate, subumbilicate areoles < 5 mm diameter or with areolate central portions and closely appressed marginal lobes; rhizines lacking.....14
14a. Thallus of suberect, swollen, bullate, subumbilicate areoles; lower surface pale brown, corticate..... .....*Rhizoplaca chrysoleuca*
14b. Thallus subcrustose, centrally areolate, with appressed lobate margins; lower cortex lacking.....15
15a. On siliceous rock; apothecia black; ascospores brownish, 2-celled.....*Dimelaena oreina*
15b. Substrate various, typically calciferous; apothecia tan to brown; ascospores hyaline, simple ..... *Lecanora*

B2

13b. Thallus foliose, with a distinct rhizinate lower cortex; thallus not areolate 16
16a. Thallus loosely adnate and convoluted; medulla bright yellow; lower cortex yellowish.....*Vulpicida viridis*
16b. Thallus closely adnate, ± flat; medulla white; lower cortex whitish to tan, brown, or black 17
17a. Lobes broad, apically rounded, some > 3.5 mm wide; upper cortex dull to lustrous 18
18a. Isidiate or sorediate; apothecia rare 19
19a. Isidiate, the isidia sometimes breaking to appear apically sorediate.....20
20a. Isidia fine, cylindrical; thallus margins ciliate.....*Parmotrema madagascariaceum*
20b. Isidia coarse, pustular, appearing apically sorediate with age; marginal cilia absent.....*Flavoparmelia baltimorensis*
19b. Sorediate, the soredia sometime originating from pustules, but coalescing to form laminal soredia.....*Flavoparmelia caperata*
18b. Diaspores absent; apothecia common.....*Flavoparmelia rutidota*
17b. Lobes narrower and typically more elongate, prevailingly < 3.5 mm wide; upper cortex ± lustrous.....*Xanthoparmelia*
8b. Upper cortex brown, gray, or bluish or greenish gray, without yellowish tints (some species may have yellow soredia or medullary tissue).....21
21a. Upper cortex brown to brownish gray, K- 22
22a. Lower surface tomentose, often felt-like.....23
23a. Lower surface with distinct raised or darkened veins or regularly maculate with large white rounded patches.....*Peltigera*
23b. Lower surface lacking raised or darkened veins or maculations 24
24a. Lower surface with abundant small pores.....25
25a. Thallus with marginal yellow soredia (often also marginally squamulose); lower surface with shallow, irregular punctations (pseudocyphellae).....*Pseudocyphellaria aurata*
25b. Thallus with abundant fimbriate-dissected marginal lobules; lower surface uniformly tan, with deep, circular pores (cyphellae).....*Sticta caroliniensis*
24b. Lower surface lacking pores; soredia, if present, not yellow 26
26a. Thallus lustrous, deep brown, with laminal, flattened, isidia-like lobules; apothecia on underside of lobe tips..... *Nephroma helveticum*
26b. Thallus dull, gray brown, lobules, if present, marginal and not strongly flattened; apothecia on upper surface 27
27a. Apothecia without a thalline margin.....*Santessoniella crossophylla* 27. Apothecia with a distinct thalline margin 28
28a. Thallus squamulose to subfoliose, grayish, with abundant whitish marginal zones; hymenium ultimately IKI+ reddish brown (sometime initially blue green); ascospore smooth sheaths ..... *Fuscopannaria*
28b. Thallus foliose, brown, essentially without whitish marginal zones; hymenium persistently IKI+ blue (only around asci); ascospores with ± short apiculus and rough sheaths ..... *Pannaria*
22b. Lower surface bare or rhizinate, lacking tomentum 29
29a. Thallus umbilicate and centrally attached or of aggregated, subumbilicate thalli; well-defined branching lobes absent or abortive; diaspores absent.....30
30a. Thallus typically > 5 cm broad; lower surface rhizinate; perithecia absent ..... *Umbilicaria mammulata*
30b. Thallus rarely > 5 cm broad; lower surface various; perithecia present and typically abundant ....*Dermatocarpon*
29b. Thallus characteristically foliose, with branched lobes; diaspores present or absent; apotheciate or sterile.....31
31a. Sorediate.....32
32a. Upper cortex densely pruinose, at least near lobe tips.....*Physconia*
32b. Upper cortex not pruinose 33
33a. Lower cortex black ..... *Phaeophyscia*
33b. Lower cortex pale 34