



A Field Guide to the
**Rare Fungi
of California's
National Forests**

Noah Siegel, Else C. Vellinga, Christian
Schwarz, Michael A. Castellano &
Diane Ikeda

Designed by: Rivkah Khanin

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Introduction

The California Rare Fungi Working Group was assigned to produce a list of potentially rare fungi found in California's National Forests for the Region 5 Forest Plan Review with a focus on the "next four forests" (Stanislaus, Eldorado, Tahoe, and Plumas National Forests) for potential listing as "Forest Service Sensitive Species". Most of the species proposed were not currently in field guides and, for many species, data was lacking to determine rarity state-wide. The main purpose of this guide is to provide a reference for National Forest personnel to use for identifying the species of interest. Another goal is to publicize the need for data reporting on all macrofungus species through citizen-science portals like iNaturalist (www.inaturalist.org) to provide basic biological and ecological information such as species distributions and possible trends in abundance. Currently the data needed to do this are lacking.

California's National Forests are mostly in montane habitats. This book focuses on Sierra Nevada, southern Cascade Range, and Klamath Range species; an area with an estimated 2,000 species. Most macrofungi found in California National Forests will not be in this guide, or any other single guide; for general identification purposes consult sources such as *California Mushrooms: The Comprehensive Identification Guide* (Desjardin et al. 2015), *Mushrooms of the Redwood Coast: A Comprehensive Guide to the Fungi of Coastal Northern California* (Siegel & Schwarz 2016), *Mushrooms Demystified* (Arora 1986), and MykoWeb's *The Fungi of California* www.mykoweb.com/CAF/index.html.

For the purposes of this guide we will use the term macrofungi to represent the group of fungi that form fruit bodies large enough to be seen by the naked eye. These fungi go by a variety of names, such as mushrooms, boletes, polypores, puffballs, truffles, cups and morels. Populations of macrofungi are difficult to survey; fruitings are ephemeral and dependent on the right conditions of moisture, temperature, and season. Finding fruit bodies is functionally the only quick, large-scale way to detect the presence of a given species in an area. This limitation means that false absence data is common—fruit bodies may be absent in any given season, even while the vegetative body of the organism is present and thriving in the substrate. Some species can go years without fruiting, and/or fruit during a short time period, leading to inaccurate occurrence data. Partly because of these limitations, macrofungi have largely been ignored on species conservation lists. Most of the macrofungus data from the California mountains comes from the late Dr. Harry D. Thiers, who generated thousands of collections between 1961 and

1989; many of the records from Yuba Pass, Silver Lake, Pinecrest and Huntington Lake were his or his students'. William Bridge Cooke and Vivian Cooke also generated a great deal of knowledge of macrofungi from the southern Cascades; contributing roughly 8,000 California collections, mostly from the Mount Shasta area and Lassen Volcanic National Park during the 1930s to 1990.

SURVEY AND MANAGE:

Due to a federal mandate in 1993, rare macrofungi occurring within the range of the Northern Spotted Owl (*Strix occidentalis caurina*)—particularly those restricted to late-successional and old-growth forests in the Pacific Northwest—were included in the Northwest Forest Plan. The plan lists 234 fungus taxa as “Survey and Manage” species (Castellano et al. 1999). One hundred twenty-nine of these were known from fewer than 10 sites, and 80 were believed endemic to the Pacific Northwest. These species were among the first macrofungi to be considered for protection on federal lands. As more data were gathered on occurrence of Survey and Manage species, the list was amended in 2003 and 2011. The National Forest System (NFS) lands within the California Northwest Forest Plan (CA NWFP) area cover the Six Rivers, Klamath, Shasta-Trinity, and Mendocino National Forests, and the western parts of Lassen and Modoc National Forests. A detailed draft report of California Survey and Manage work was prepared by Hoover et al. (2015).

FOREST SERVICE SENSITIVE SPECIES:

The Plumas, Tahoe, Eldorado and Stanislaus National Forests recognized five species on the Forest Service Sensitive list: *Dendrocollybia* (*Collybia*) *racemosa*, *Otidea smithii*, *Pachycudonia* (*Cudonia*) *monticola*, *Phaeocollybia olivacea*, and *Rubroboletus* (*Boletus*) *haematinus*. Of these, we consider only *Otidea smithii* and *Pachycudonia monticola* to be rare in California, with the only record of *O. smithii* from National Forest land in California appearing to be a misidentification. Both *Dendrocollybia racemosa* and *Phaeocollybia olivacea* are common and widespread in the California coastal province, and in the Klamath Mountains. In the Sierra Nevada, *Phaeocollybia olivacea* appears to be restricted to areas with Tanoak (*Notholithocarpus densiflorus*), and *Dendrocollybia racemosa* is found occasionally in the foothills. *Rubroboletus haematinus* is widespread and locally common in high-elevation Red Fir (*Abies magnifica*) forest.

IUCN GLOBAL FUNGAL RED LIST:

The Global Fungal Red List Initiative (<http://iucn.ekoo.se/en/iucn/welcome>) was started in 2014 to propose and assess species for the International Union for Conservation of Nature (IUCN) Red List. Two North American working groups (April

2016, February 2018) have met and assessed 76 macrofungus species, assigning 16 as Critically Endangered, Endangered, Vulnerable, or Near-threatened. Many of the species proposed for California's National Forests would be currently considered data-deficient under the criteria required for assessment by the IUCN. Including them on a California list and undertaking active surveys for them will allow us to gather the data needed to assess these species by IUCN criteria.

CALIFORNIA RARE FUNGI WORKING GROUP:

On January 19, 2017, the California Rare Fungi Working Group met for the first time, and comprised the following participants: Dr. Thomas D. Bruns (UC Berkeley), Thea Chesney (USDA Forest Service, R5 Range Ecology), Dr. Michael A. Castellano (USDA Forest Service, Northern Research Station), Scott Davison (Humboldt Bay Mycological Society), Dr. Dennis E. Desjardin (San Francisco State University), Diane Ikeda (USDA Forest Service, R5 Regional Botanist), Dr. Gregory M. Mueller (Chicago Botanic Garden), Dr. Brian A. Perry (Cal State East Bay), Christian Schwarz (UC Santa Cruz), Noah Siegel, Dr. Frederick A. Stevens, Dr. Else C. Vellinga (UC Berkeley), and Michael G. Wood. The group was tasked with generating a list of potentially rare fungi found in California's National Forests, with a focus on the "next four forests" (Stanislaus, Eldorado, Tahoe, and Plumas National Forests) for the Forest Plan review. The California Rare Fungi Working Group proposed a list of rare fungi occurring in California (Region 5) National Forests, using the Heritage and Survey and Manage guidelines to assist with species assessments, including the number of locations from collections or identifiable photographs in California; whether the species are tied to a threatened habitat (old-growth forests, Whitebark Pine, etc.); and whether there are taxonomic difficulties surrounding the name (e.g. species complex, misapplied name for an undescribed species, etc.).

The Rare Fungi Working Group proposed a list of 112 macrofungus species, later increased to 128 species with 16 "placeholder" species profiles from the Survey and Manage species under the Northwest Forest Plan, which were considered too common to be included on a California rare species list. The Group included species that occur on other Sierra Nevada National Forests including the Inyo, Sequoia and Sierra National Forests. Given the lack of knowledge of fungal species ranges, it also considered species that occur in the southern Cascades and Siskiyou Mountains; thus we are confident that the existing profiles adequately represent the Northern Province forests.

The profiles are based on accessible data existing as of June 2017, mostly from herbarium records included in MyCoPortal (www.mycportal.org), the collection

database for most of the North American fungal herbariums. A majority of the herbarium collections reside at SFSU, and most of these collections were examined as part of this project. Additional data came from the citizen science portals iNaturalist (www.inaturalist.org) and Mushroom Observer (www.mushroomobserver.org), as well as mycologist review for each species.

We expect that targeted surveys for these species will reveal that some are more common than currently thought, while others may have declined, as many are only known from historic records. Other species may be tied to threatened habitats; these should be identified, as there is little existing data to enable robust associations between fungal species and specific habitats. We recognize the difficulty of determining whether a species is truly rare, or rather whether it simply rarely fruits, or rarely gets reported. Species-specific DNA primers have been developed such that soil samples can be tested for the presence of particular fungi in the absence of fruit bodies (Gordon & Apple, 2011). However, searching for a particular species by this method is akin to looking for a needle in a haystack, and funding for such work is exceedingly limited. At this time, tracking data on the location, abundance, and habitat associations of fungal fruit bodies is the most feasible approach to achieve a better understanding of California's macrofungi.

How to Find Macrofungi— the Fundamentals

Mushrooms are the sexual reproductive structures of some kinds of fungi—they are produced to make and release spores, which are typically then dispersed either by wind, animals, or in some cases, water. Generally speaking, mushrooms are highly seasonal in their appearance, requiring specific soil moistures, temperatures, and ecological conditions before they appear. For someone seeking to survey mushroom diversity, this means that keeping track of the weather is very important.

Although many mushrooms fruit above the forest floor with a very pronounced, obvious stature (often called epigeous fungi), many other mushrooms remain substantially covered in duff, or are very small and easily hidden under flakes of bark, or inside stumps, or beneath leafy vegetation. Even some very large mushrooms never fully emerge from the soil, and may only be visible as low humps or mounds on the forest floor. Eventually, you'll learn to “read” the forest floor, and will be able to spot a small glimmer of the cap peeking through thatched forest litter, or a slight mound in the surface of the duff layer, or even a small crack in the soil that reveals the presence of a mushroom. This skill will become more

honed the more it's practiced, and having a mentor to demonstrate will speed it up dramatically. Additionally, the more familiar you become with what a mushroom looks like, the easier it will be to discover when present. This is a function of the "search image" model of the way our brain works—the better sense we have of what we're looking for, the easier it is for us to pick out that information from a noisy background.

Truffles (often called hypogeous fungi) mostly fruit underground and, as such, are much more difficult to find—they rarely reveal their presence to humans. When mature, however, the truffle fruit bodies emit odors that attract mammals, who then excavate the fungi and consume them, thereby spreading spores in their fecal matter. You can often find truffles by raking the duff back around recently dug holes (usually the work of squirrels, voles, etc.). In its most intensive form, a surveyor will pull back about a half-meter of duff around the hole, rake the underlying soil, and then replace it when finished. Most truffles fruit in the contact zone between the organic layer and the mineral soil. Be aware that many of these truffle fruit bodies bind soil to their exteriors—be sure to gently squeeze any larger clumps of soil to make sure there aren't truffle fruit bodies hidden within them.

THE SEASONS: WHEN TO FIND MUSHROOMS

There are three primary macrofungus fruiting seasons in the California mountains: The spring season from late February or March in the lower foothills (continuing into July on higher peaks); the summer season, typically ranging from mid-July into September; and Fall—from September into November or December (continuing later in the foothills). There is relatively little overlap between the assemblages of spring and fall fruiting species, while summer has spring and fall species mixed into either end, as well as its own suite of species, and each season is highly dependent on precipitation.

Macrofungus fruitings during the spring season are mostly in response to moisture derived from snowmelt, and increasing temperatures. The depth and persistence of the winter snowpack greatly affects the timing of the spring fruiting season, as do early rain storms. During this time, fruit bodies can appear near the melting snowbanks as well as in areas that have been snow-free for weeks. A soaking rain a couple weeks after snowmelt can prolong the fruiting for a few weeks, while hot conditions and/or winds can put a quick end to the fruiting season.

The summer 'monsoon season' occurs following the summer thunderstorms, which tend to occur primarily in the southern and central Sierra Nevada. These storms can be widespread or highly localized, and can sometimes result in massive fruitings for a short period after the rains fall. As little as 1 cm of precipitation

can trigger fruitings, although successive storms of 2+ cm a few days to a week apart are ideal. Amazingly, single peaks or ridgetops can be fruiting while the next ridge over is dry and fruitless. If you intend to catch up to these fruitings, watching weather reports and radar, as well as following precipitation maps, is crucial. The website <https://water.weather.gov/precip/> has an interactive precipitation map that can pinpoint the rainfall from the last week, 2 weeks, 30 days, etc. Some mountain localities can go years without significant precipitation, and macrofungus fruitings will be scant to non-existent during these periods.

The fall season can be rather short during some years, especially at higher elevations where the first precipitation often falls as snow rather than rain. On the other hand, some seasons see warmer storms and high snow levels later into the year. Light snow cover (without a deep freeze) followed by subsequent melting a few days to a week later can produce wonderful fruitings, as this pattern seems to hold moisture in the duff and stimulate growth in the following warm period.

WHERE TO FIND MACROFUNGI

The California mountains can be a harsh environment for macrofungi, which limits dispersal of many species and has led to numerous specialized species associated with a specific substrate. There are macrofungi that only fruit on the edges of melting snow banks, or during the spring following forest fires, or after summer thunderstorms—likewise, different habitat types will have different species. A high-elevation Red Fir forest will have different macrofungi than a mid-elevation forest dominated by Ponderosa Pine and Douglas-fir.

TARGETING SPECIES

Sometimes, you'll be interested in finding a specific species—one that you find particularly intriguing or attractive, or maybe you've been hired to do surveys for rare species conservation. In such cases, it helps immensely to do your homework beforehand. Read up on the habitat preferences, typical fruiting dates, and identification criteria for that species. The substrate can also be extremely important—for example, until we realized that *Tubaria punicea* grows primarily on the rotted bases of old madrone trees, we thought it was quite rare—but as soon as we started to key in on this particular substrate, we found it to be rather common during midwinter in mixed-evergreen forests. Species like *Mitruula elegans* only grow on saturated debris in mid- to high-elevation meadows and seeps, while *Hygrophorus goetzii* only fruits at the edges of melting snowbanks in areas with Mountain Hemlock. Knowing such details will help you find these species.

Collecting and Vouchering Fungal Specimens

ON COLLECTING MUSHROOMS

Questions are often raised about whether picking macrofungi impacts the survival of the species in that particular location. To begin, it must first be understood that the macrofungi that we see are just the reproductive structures of an organism that is mostly hidden in the soil or wood. This means that when you pick a mushroom, the vegetative part of the organism is left behind. Most macrofungus fruit bodies last only a short period of time, from a few hours to a couple of weeks. Exceptions are the perennial conks that stay on the wood for many years; for example, the fruit bodies of *Bridgeoporus nobilissimus* are estimated to grow for a hundred years or more. In rare cases, picking definitely harms the species' survival in that area. However, with regards to fleshy fungi, the available studies on the impact of picking or cutting chanterelles and other macrofungi have not shown any effect on fruit body production in subsequent years (Norvell & Roger 1998; Egli et al. 2006). Trampling of the forest soil had an impact on macrofungal fruiting in Switzerland (Egli et al. 2006). Large-scale raking of forest soil to find young Western Matsutake mushroom buttons or truffles is definitely detrimental, as it limits spore dispersal of many species, and the disturbance of the forest floor affects the entire soil biota.

As explained above, harvesting macrofungi typically does not significantly impact future macrofungus production, especially not at the scale of collecting for scientific purposes. Collecting serves several purposes. For example, it is sometimes impossible to identify a macrofungus species in the field, as microscopic characters have to be examined before one can be certain of identification.

Making voucher collections of macrofungal specimens is an extremely important way of making a lasting contribution to science. Voucher collections are physical objects—preserved fruit bodies of macrofungi kept with notes and reference numbers that allow future investigators to link the physical specimen with an image, date, location, and description. The value of such specimens is hard to overstate. Although the dried fruit body itself might not look much like its original form, it can be used for extracting and analyzing DNA, and retains most of its microscopic features.

It has become clearer with time that in numerous taxonomic groups, easily observable characters such as color of the cap are not a good indication of species limits,

for example in the genus *Russula* (Bazzicalupo et al. 2017). DNA information can help in distinguishing these difficult species groups and often help clarify ecological information.

Voucher collections also allow future taxonomists to measure traits from a wide range of representatives of a species, and allow ecologists to “go back in time” to a particular place and investigate how the organisms living then and there differed from those in modern times.

Another reason to collect macrofungi and keep vouchers is that many species remain nameless, and the distinctions between many other species have not been well sorted out. Are the species we find in California really the same as the ones in eastern North America and in Europe going by that same name? When “elfin saddles” in the *Helvella lacunosa* group were examined with molecular tools, we found that there are three or four species instead of one! In the past, the name *Helvella lacunosa* had been used for all of them—now it appears that *H. lacunosa* does not occur in California (Nguyen, 2013). This research was only possible by investigating existing voucher collections.

HOW TO COLLECT

There are some general guidelines about best practices for making mushroom collections while minimally disturbing the environment in which the mushroom is growing. A long digging tool, such as a knife or small trowel, and a tackle box or waxed paper bags to store your finds are both extremely useful. Remember



How to handle mushrooms with care. Photo by: Nhu Nguyen

also to handle your mushrooms gingerly—try not to touch the various surfaces more than necessary—too much handling might inadvertently remove some important characters from the specimen, especially on the surface of the stipe.

It's always a good idea to make photos in the field that show the habitat the mushrooms were growing in, as well as the physical characters of the mushrooms themselves. More information on this is in the chapter on submitting data to iNaturalist.

The best collections are made up of a reasonable number of fruit bodies, preferably in different stages of development from young to old, and in good condition (not moldy or decaying, or missing their gills or pores due to invertebrate grazing). Secondly, the complete specimen should be collected; the base of the stem might be deep in the soil, and there may be a volva (a cup of veil at the bottom of the stem)—these features are part of the fruit body and provide valuable information.

Make notes about where the mushroom is found: Is it growing in soil, on wood, and if so, what kind of tree, on the bark or on the bare wood. In what kind of forest? What are the closest tree species? Especially when in the mountains, keep track of altitude and exposure or aspect of the slope. Also note overall habitat: forest age, (it is especially important to note if there is an old-growth component), has there been disturbance, and fire history (recent or historic).

Wrap big mushrooms in wax paper bags or sheets, and use tackle boxes or com-



Basket with various collection gear. Photo by: Else Vellinga.

partment boxes for the smaller specimens—you can even pad these with some moss or leaves. Plastic bags are not good—they make mushrooms rot rather quickly so bring ample supplies of wax paper. Don't mix your collections—place only one species in a wax paper bag, or in a compartment in your box. Put your specimens in a basket or bucket—something sturdy in which the specimens will not bump into each other too much on the way back home (throwing them straight into your backpack is not a good idea). Make sure that smaller mushrooms are not smashed by the bigger mushrooms that might get put on top of them.

WHAT TO DO WITH YOUR MUSHROOMS WHEN BACK HOME

In general, the best approach is to work on your collections right away. If you don't have time to do so, put them in the refrigerator, and keep them in their wax paper wrappings or tackle boxes so that they don't dry out. Don't put off working on them for too long—macrofungi have a short shelf life and spore production might halt. If you're intending to do microscope work, keep in mind that spores from macrofungi kept too long in the refrigerator are often larger or misshapen compared to those released under natural conditions. In some species, such as those in the genus *Russula*, spore release stops altogether, so you can't make a spore print.

If you have no idea about the genus of your specimens make a spore print for gilled and pored macrofungi. Take a mature specimen, cut off the stem and put the cap on white paper, glass or aluminum foil with the gills or pores facing down. Cover it with a glass or bowl to keep it from drying out. Wait 6–12 hours, lift carefully and you'll hopefully reveal a nice spore print. Some special cases: if you're trying to identify a crust fungus, getting mature spores for microscopic investigation is a must. Make a spore print by putting a glass microscope slide on the crust, wrap everything in a moist paper towel, and let it sit (glass slide downwards) in



Spore prints. Photos by: Nhu Nguyen.

a plastic bag overnight, then carefully remove the slide. Most truffles and other ‘potato-shaped’ fungi do not forcibly eject spores, so you can’t typically make a spore print from them.

To preserve macrofungi in a herbarium, they have to be dried. This is a bit different than the method for plants, which are pressed. Plants retain a lot of their fresh characters, but a dried mushroom does not look anything like a fresh one. Consequently, this means that the collector ought to make some notes, especially with regards to those characters that vanish or change when dried—particularly size, colors, gill attachment to the stem, any exudates, and in some cases, the color change reactions to chemicals. Smell and taste are very important as well! Cutting truffles in half and photographing both the gleba (inside) and the peridium (outside covering) is particularly important. There are many sources for standardized forms to help you take such notes for most types of macrofungi (e.g. Castellano et al. 1999, Castellano et al. 2003). It’s also good to take some photos at home to supplement field photos. Depending on the degree of data quality needed, cross-sections of fruit bodies, close-ups, and photos with scale bars or rulers and color-standard cards can be made at home after collection.



Dried and fresh specimens of Lepiota luteophylla. Photos by: Else Vellinga and Noah Siegel.

DRYING MUSHROOMS

A food dehydrator works perfectly well to dehydrate macrofungi. There are several different types, but most have a heating element with a temperature switch, a fan that circulates warm air around, and trays or screens on which the specimens are laid. The ideal temperature for drying macrofungi is around 40–45°C (don’t go much higher than 115°F). Thick or large fruit bodies should be cut in half or into smaller pieces to be dried. It takes anywhere from a few hours for small fruit bodies to a few days for big ones to be completely dried. You can then take your

completely dried macrofungi (*make sure they are really crispy dry!*) and put them in a plastic resealable bag for temporary storage. Keeping track of which mushroom on the dehydrator matches which of your photos is a bit of an art, and is an extremely important skill to learn if you're going to make voucher specimens.

When you will be traveling to places without a dehydrator and would still like to dry macrofungi, there are options! Homemade devices that use light bulbs, candles, or oil lamps as heating elements work well (De Kesel, 2001), but you have to be a bit more careful that your macrofungi don't get burned or cooked which will degrade the DNA! Sealed plastic containers with silica beads also work (making sure to change silica when it gets saturated).

CARE OF DRIED SPECIMENS

Your dried specimens need some care as well. They need a label, with information on the name of the species (if known), the collector's name, the date collected, the locality, and the iNaturalist observation number. Putting your specimens in sealed plastic bags with silica gel packets (inexpensive and reusable) is a cost-effective strategy for the home herbarium. Keep in mind that dried macrofungi can attract pests—beetles in particular love macrofungi. Routine maintenance should include occasionally freezing your macrofungi for at least 3 days at -20°C . Most big institutions do this on a yearly schedule. It's best to keep the temperature as low as possible, and the humidity low as well. Regular checks for bugs are a must—polypores especially are a beloved food source! Low humidity not only keeps bugs away, it also keeps mold from growing on your dried macrofungi (see Thiers, 2012). This can be difficult to accomplish at home—most institutionalized herbaria have metal cases for the specimens that keep bugs out, and maintain a low temperature and keep an eye on the humidity as well. Thus, if you can find an institutional home for your collections, do so. But space is at a premium at most universities, so this can be hard to find. Do the best you can! Many amateurs have managed to build and maintain collections of significant size for decades with a little effort.

Data Sharing

Your specimens offer information not only for yourself but for conservationists, taxonomists, and forest managers. Sharing your data is of utmost importance. iNaturalist (iNat for short, www.inaturalist.org) is the ideal one-stop shop for sharing photographs and locations of your macrofungus finds. For herbarium specimens, MyCoPortal has all the necessary data fields (www.mycportal.org). There you can also print labels for your specimens, upload photos, link to DNA data, and so forth.

HOW TO MAKE OBSERVATIONS USING iNATURALIST

iNat is a tool for making, storing, and displaying records of living things. Most fundamentally, these records combine three important pieces of information—a species name, a date, and a location.

The mission and methods of iNaturalist fall under the general umbrella of citizen science—a model in which non-professionals, amateurs, hobbyists, enthusiasts, and total novices alike are empowered to engage with and contribute to our shared knowledge about the biological world. These contributions can be harnessed for use in the scientific process at higher levels of investigation.

Although there are other platforms for this kind of data, we've found iNat to be the most flexible and it is powerful and easy to use. One of the basic truths about citizen science data is that it becomes more valuable as more people use it and contribute new data. When a new observation is added, it represents another data point to add context to other data points—thus increasing our understanding of that species through space and time.

This publication is focused on macrofungi, but one of the amazing things about iNat is that it isn't devoted to any particular group of organisms. Rather, it's a repository for records of all kinds of biodiversity. We find this especially attractive because it allows us to paint a sort of ecological picture of a day or a place by documenting all the kinds of organisms that we find—a more holistic way of representing ecosystem webs than what one finds on portals that are devoted to a single taxon (like eBird).

iNaturalist can be accessed both as a website as well as through a smartphone app—these two avenues have some overlapping functions, but in general the website is best suited for searching through and exploring existing data, while the mobile app is better for adding new observations taken with your phone's camera.

GETTING STARTED WITH iNat

To get started adding observations, you'll need to make an account and confirm it using your email address. Then download the iNat app for your smartphone (the app is not necessary if you're only going to use the website to add photos or explore data, but the app is by far the best and easiest way to add new observations). Either way, you'll log in to the app and website using the same username and password. You can also sign in using a linked social media account (typically Facebook).

Once you've opened the app, we recommend that you go into the settings (little green gear symbol at the upper right) and turn off the Automatic Upload option—it can really drain your battery and use up data if you aren't in WiFi range. Typically we upload our observations only when connected to WiFi.

To make your observations as scientifically useful as possible, make sure that the Privacy settings on your smartphone are set to allow the Camera to tag your photos with location data. Geo-tagging will work even when your phone is in Airplane Mode, which is a great battery-saving tip for long hikes or backpacking trips.

GEOPRIVACY

We realize that you might not want to give away the exact location where you found a mushroom or other organism, and we encourage you to use iNat's geoprivacy settings in such cases.

You can choose from three different levels of privacy for your observations: 1. **Public** (anyone can view the observation coordinates). 2. **Obscured** (a large box around the coordinates such that people can only see generally where your observation was made). 3. **Private** (no one can view the observation coordinates).

For more information about geoprivacy on iNaturalist see this article:

<https://www.inaturalist.org/pages/geoprivacy>

Even observations that are mapped more generally (say, to county level rather than with precise coordinates) are useful for other reasons: They can help scientists keep track of when a certain flower blooms or a certain macrofungus fruits. Remember that iNat observations contain three basic pieces of data: Identity, Date, and Location. If one is obscured, the other two pieces can still be very useful for investigating other kinds of questions.

TAKING PICTURES

Although pictures are not required for iNat observations, most observations do come with a photo. Only observations with some sort of verifiable documentation (photo, sound recording, etc.) are eligible to become "Research Grade" (see the

section on Data Quality).

So how can you make sure you're taking the best photos possible for the purposes of iNat?

First, **get close** to your subject. The larger the organism appears in the frame of the photo, the more detail will be visible. Obviously this should be done safely: Don't get too close to a rattlesnake, or climb up a cliff just to get a better shot.

Secondly, **take multiple photos**. Photos taken from different angles and showing different structures of an organism's morphology will always give more information than a single photo. With macrofungi, it's best to always take a photo from above, from below (showing the underside of the cap), and from the side. If there are multiple fruit bodies available, you can pick a few and lay them down or hold them next to some upright ones to get a nice staged group photo (like those in this book).

Lastly, **use magnification** when appropriate. The zoom function on your phone can be really helpful to highlight key details (although keep in mind that image resolution goes down as you zoom in, especially in low light). One excellent technique is to hold a hand lens in front of your phone's camera. However, holding your phone and a hand lens at the same time as taking a picture can be tough to juggle. Thankfully, there are a number of relatively inexpensive clip-on macro lens attachments designed for phones available online. Make sure the model you purchase fits your phone (including the case).

Note that you can take photos either directly through the iNat app by tapping the camera button at the bottom of the screen, or you can add photos you've already taken by tapping the Library symbol (which appears to the right of the green circle after you tap the camera button).

Rather than taking photos in the app, we generally prefer to take photos using the phone's normal Camera tool, and then add images from the photo library later in the day. This allows us to focus on taking lots of photos in the field, although it does require a bit more work at the end of the day. With some practice, you'll get quick at it!

You can also tap the "What did you see?" bar to view automatic suggestions made by a computer-vision algorithm. This tool compares the photo you've taken with identified photos already in the iNat database and suggest similar-looking species. It doesn't always work perfectly, but it's often accurate, especially for more well-known groups like wildflowers, birds, and some insects.

If you tend not to use your phone to take photos, and instead use a dedicated camera such as a DSLR (or if you have scans of slides and film photographs), you can upload files through the website rather than the app. You'll need to know the location where the photographs were taken (approximate locations are fine), and the dates on which they were taken. There are many helpful controls built into the website's uploading dashboard that allow you to batch-edit multiple photos at once, which is especially useful if you've got your photos sorted by species or by location.

USING iNat to EXPLORE WHAT LIVES IN YOUR AREA

You can use the iNaturalist website to find out what organisms live near you, or in an area you plan on visiting. By clicking the "Explore" button on the header of the website and using the Filters to adjust various parameters, you can get map displays, grid displays, or list displays of observations that people have made in a given area. You can fine-tune for groups of species, time of year, and many more variables. For example, it's easy to display all the dragonflies observed in Mexico in August of any year, or all of the plants in the sunflower family from Los Angeles County seen in 2012.

The phone app also allows you to do some general searching for what organisms live in a particular area by using the Explore icon at the lower left, but the functionality is more basic than on the website.

HOW DOES VOTING WORK? WHAT ABOUT MISIDENTIFIED OBSERVATIONS?

When you add an observation to iNat, people will either 1) propose a name (if you left it blank), 2) agree with the name you proposed, or 3) propose an alternative name to the one you suggested. The name displayed in the face of potentially conflicting votes is determined by an algorithm that weighs the number of people who agree with an identification for a particular observation vs. those who disagree and determines the most accurate common denominator. Don't worry too much about this—disagreements are bound to happen, and remember that you can always use "Tags" to keep notes that help you find your observations.

If you're worried that you won't be able to find your observation of that cool big, red mushroom you found because you won't be able to remember the scientific name, you can add the tags "cool, big, red, mushroom" to the observation and then use those terms in the Tag field of the Explore page's Filter to find your observation. This feature is also really useful to keep track of particular traits or variants—you can add tags like "albino" or "leucistic" or "color variant" to observations of organisms that lack pigment or show abnormal colors, making these observations easier to find in the future.

People are often (understandably) concerned about the quality of the data generated by citizen science projects. Fortunately, the iNat system has a number of safeguards to try to keep data quality high. In citizen science, there is generally some tradeoff between the quality of data and the volume of data received—the easier it is to contribute, the more likely it will be that there will be mistakes. But if the data is too tightly controlled, there tends to be a steep decline in the amount of data coming in. In general, it's better to “keep the gates wide open, but the doorway narrow”. To that end, iNat uses the **Research Grade** rank to identify that subset of observations that are of relatively higher quality, and which are exported to other biodiversity databases for use by researchers around the world.

The iNaturalist YouTube channel is a great resource for learning how to use specific tools on the site. There are primers for documenting different groups of organisms as well (including one specifically about making useful observations of macrofungi). https://www.youtube.com/watch?v=LKF_pIY0Zpc

WHY IS CITIZEN SCIENCE IMPORTANT?

There is immense aesthetic value in learning about the curious and beautiful organisms that surround us. Being a naturalist is a rich way of living; every moment outdoors becomes an opportunity for discovery, and the days are filled with reflection on past encounters and anticipation of future delights.

But beyond the personal benefits of being a naturalist, citizen science tools allow us to expand our experiences into something much larger and more important than our individual experiences in isolation. Citizen science tools help us build context, join narrative threads that emerge from the mass of our experiences and observations, and coordinate efforts to investigate emerging phenomena.

The health of habitats and ecosystems on small scales are important reflections of the health of the global ecosystem. But determining how “healthy” or well-functioning an ecosystem is can be difficult. There is no obvious single metric to use, so we focus on things like biodiversity—how many species are there in a habitat or local ecosystem. Citizen science tools allow us to keep track of this kind of metric more efficiently now than has ever been possible in human history.

In a world undergoing rapid change, we also focus on *biogeography*—the geographic area where a species lives at any given moment in time. Where a species lives on the face of the planet is called its range. Ranges change over time for all sorts of reasons—competition, changing climatic conditions, changes in the age of forest habitats, etc. Likewise, *phenology* is changing—this term refers to the timing and seasonality of major events in the lives of organisms. As temperature

and rainfall patterns around the globe shift due to climate change, the responses of living creatures to those patterns also shift. This can have dramatic consequences if species that are normally aligned in their phenology suddenly find themselves out of sync—if birds migrate before their prey insects have hatched, they may find themselves in a cold boreal forest without much food to fuel their breeding and nesting efforts. Keeping track of these shifts requires a sustained effort involving the accumulation of numerous observations repeatedly, year after year. This is the kind of task that citizen science is well-suited for, and which would have been almost impossible to perform at any large scale in the past.

Steps for Making an iNat Observation and a Vouchered Collection

Below is a general outline of the process—there are many possible variations on this protocol, and you'll have to experiment and modify accordingly to decide what works best for you.

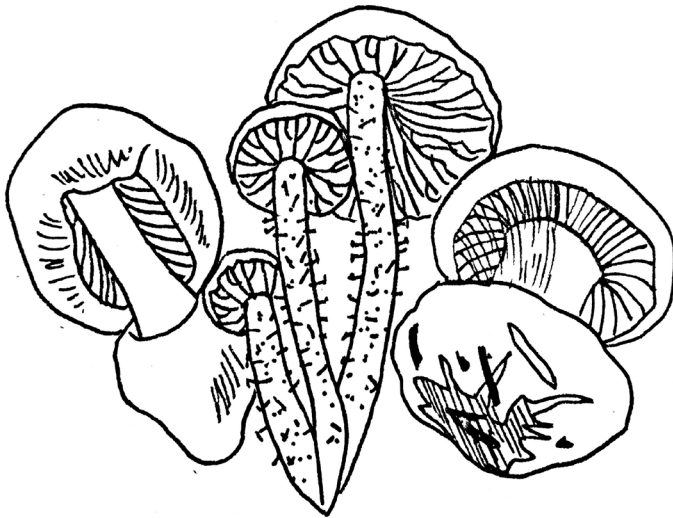
- 1.** Find a group of macrofungi in the woods.
- 2.** Once you've decided you're going to document/voucher/collect these macrofungi, set up the specimens to take a photo—place a number of fruit bodies of different ages next to each other if possible, showing different angles to the camera at once.
- 3.** Put a slip of paper with your personal collection number next to the collection before you take the photo.
- 4.** Take multiple photos from all angles, and with and without specimen label.
- 5.** Place the specimens into a tackle box or wax bag, and place the slip of paper with your personal collection number in with them.
- 6.** Put your specimens on the dehydrator with their collection number (keep in mind that most dehydrators will blow the paper tag around unless you secure it in place with the collection, either by putting them all in a small perforated container, or by using a small piece of tape and dividers to keep collections separate and organized).
- 7.** Upload the photo of the collection to iNat and then write out or print a slip of paper with the name, location, date, and iNat URL #.
- 8.** When the specimens are dried, put them in a sealed plastic bag and add the corresponding slip of paper from step 6 to track them. Seal it tightly, pressing out any air as needed.
- 9.** Add a tag, comment, or description to the iNat observation indicating the voucher specimens—this alerts researchers that they can ask you for material to study more closely.
- 10.** Be responsive to requests! You may be surprised when someone asks you to examine your specimens, be prepared to send a small piece of the collection in relatively short order.

National Forests and National Parks Abbreviations

The names of National Forests and National Parks are abbreviated throughout the book. Occurrences in the species accounts are listed in a north-south order.

Angeles National Forest	ANF
Cleveland National Forest	CNF
Eldorado National Forest	ENF
Humboldt-Toiyabe National Forest	H-TNF
Inyo National Forest	INF
Kings Canyon National Park	KCNP
Klamath National Forest	KNF
Lake Tahoe Basin Management Unit	LTBMU
Lassen National Forest	LNF
Lassen Volcanic National Park	LVNP
Los Padres National Forest	LPNF
Mendocino National Forest	MeNF
Modoc National Forest	MoNF
Plumas National Forest	PNF
Redwood National and State Parks	RNP
San Bernardino National Forest	SBNF
Sequoia National Forest	SeqNF
Sequoia National Park	SNP
Shasta-Trinity National Forest	S-TNF
Sierra National Forest	SieNF
Six Rivers National Forest	SRNF
Stanislaus National Forest	StaNF
Tahoe National Forest	TNF
Yosemite National Park	YNP

GILLED MUSHROOMS



Aphroditeola olida

(Quél.) Redhead & Manfr. Binder

COMMON NAME: Pink Bubblegum Mushroom

SPECIES CODE:



FAMILY: Hygrophoraceae

SYNONYMS: *Cantharellus morganii* Peck, *Cantharellus olidus* Quél., *Cantharellus rosellus* Peck, *Clitocybe morganii* (Peck) H.E. Bigelow, *Hygrophoropsis morganii* (Peck) H.E. Bigelow, *Hygrophoropsis olida* (Quél.) Métrod

SUMMARY: A small pink-capped mushroom with shallow, decurrent, forking gills, and a sweet bubblegum, grape soda, or root beer-like odor. Widespread across western North America: Rare in California, currently known from five sites (from photographs only), and ~50 additional locations in western North America.

TAXONOMIC NOTES: Long called *Hygrophoropsis olida* and *H. morganii*, Redhead (2013) erected *Aphroditeola* to accommodate this species. Phylogenetic research places it in the Hygrophoraceae (Agaricales), whereas *Hygrophoropsis* is in the family Hygrophoropsidaceae (Boletales).

DISTRIBUTION: Widespread across northern North America, further southwards in the mountains. Also in Europe and Asia, and reported from Costa Rica. Rare across its range. Known from the North Coast, southern Cascades and Sierra Nevada in California. All California records are based on photographs only (* =

no herbarium specimens reported). **USA:** **CA:** Siskiyou Co., S-TNF, Moosehead Creek*. **Humboldt Co.**, Lord Ellis Summit*. **Sierra Co.**, TNF, Chapman Creek Campground*. **El Dorado Co.**, Sly Park Campground*. **Tuolumne Co.**, StaNF, Italian Bar Road*. **OR:** 8 sites. **WA:** 11 sites. **AK:** 3 sites. **ID:** 3 sites. **MT:** 1 site. **WY:** 1 site. **CO:** 8 sites. **AZ:** 1 site. **NM:** 1 site. **CANADA:** **BC:** 9 sites. **AB:** 1 site. **EASTERN NORTH AMERICA:** ~20 sites.

DESCRIPTION: **CAP** 1–4.5 cm across, broadly convex to nearly plane with an inrolled margin when young, becoming more broadly funnel shaped, with a wavy or irregular margin. Surface dry to moist, finely tomentose to smooth. Pink to pale coral pink, occasionally with dingy pink splotches and stains, fading to pinkish white to pinkish buff in age. **GILLS** decurrent, shallow, forking repeatedly, often wrinkled and cross veined. Whitish to pale pinkish. **STIPE** 1–5 cm long, 0.2–0.5 cm wide at the apex, equal or thinner towards base. Surface smooth, dry. Pale pinkish to whitish, developing darker pinkish spots and stains with age. **FLESH** thin, fibrous, white. **ODOR** pleasant, fruity, like bubblegum, grape soda and/or root beer. **TASTE** indistinct. **SPORE DEPOSIT** white. **MICROSCOPY:** **Spores** 3–6 x 2.5–4 μm , ellipsoid to spindle-shaped, smooth, inamyloid. **Basidia** 20–35 x 4–6 (8) μm , 2- or 4-spored. **Pleurocystidia** and cheilocystidia absent. **Pileipellis** irregular hyphae 2–6 μm in diameter. **Clamp connections** present.

ECOLOGY: Solitary, scattered, or in small groups, fruiting in late spring and fall. Saprobic, growing in moss or duff in conifer forest. California collections are often in damp areas with moss cover in mid-elevation forests.

SIMILAR SPECIES: *Contumyces rosellus* is usually smaller, has more widely spaced gills and thin, almost translucent flesh, and lacks any distinctive odor. Some members of the *Hygrophoropsis aurantiaca* group also have shallow forked gills, but differ in cap and gill colors, and lack any distinctive odor, or have a faint odor of fresh parsley.

Arcangeliella crassa

Singer & A.H. Sm.

ALT. NAME: *Lactarius crassus* (Singer & A.H. Sm.) Pierotti

COMMON NAME:

SPECIES CODE: ARCR10



FAMILY: Russulaceae

SYNONYMS: *Gastrolactarius crassus* (Singer & A.H. Sm.) J.M. Vidal, *Arcangeliella tenax* A.H. Sm. & Wiebe

SUMMARY: This sequestrate species can be recognized by the medium size (larger than other montane '*Arcangeliella*' species), pinkish buff colors, a gleba which is often obscured by a peridium when young, and a strongly acrid taste. Fresh fruit bodies exude white latex when cut, older or drier fruit bodies often lack latex. Occurring in higher elevation fir forest in the Sierra Nevada and the southern Cascade and Klamath ranges, with ~25 known locations.

TAXONOMIC NOTES: Described by Singer and Smith, from a collection made in StaNF, California. Thiers (1979) considered *Arcangeliella tenax* a distinct species. Further study (Thiers, 1984) referenced the considerable overlap in the characters used to separate *A. crassa* from *A. tenax*, (described from Mount Hood, Oregon) and considered them synonyms. These sequestrate *Lactarius* have been called *Arcangeliella*. However, it is a fruit body form that has evolved multiple times within the genus *Lactarius*, and most species have been formally transferred to *Lactarius*.

DISTRIBUTION: Widespread in mid- to high-elevation forests in the Sierra Nevada and the southern Cascade and Klamath ranges in California, and more rarely in the Oregon Cascades. **USA: CA: Siskiyou Co.,** KNF, Ball Mountain. KNF, Martin's Dairy. KNF, South Fork of Salmon River. S-TNF, near Little Glass Mountain. S-TNF, near Harris Spring. S-TNF, Mt. Shasta, Red Fir Flat. **Tehama Co.,** Mineral. **Sierra Co.,** TNF, Yuba Pass. TNF, near SFSU Sierra Nevada Field Campus. TNF, Highway 89, north of Sattley. **Nevada Co.,** TNF, Skillman Flat Campground. **El Dorado Co.,** ENF, Icehouse Lake. ENF, Silver Fork Road, off Hwy 50 at China Flat. ENF, Audrian Lake near Echo Summit. ENF, Highway 50, 36-mile tract. **Amador Co.,** ENF, Silver Lake Campground. **Tuolumne Co.,** Stanislaus-Tuolumne Experimental Forest. StaNF, Cow Creek (Type). StaNF, Pinecrest Campground. **Fresno Co.,** SieNF, Huntington Lake. SieNF, McKinley Grove Road south of Dinkey Creek. SieNF, Ross Creek. **Tulare Co.,** near Mount Whitney. **OR:** 2 sites

DESCRIPTION: **CAP** 2.5–8 cm across, convex to broadly convex when young, remaining so, or becoming plane to centrally depressed, wavy and irregular when mature. Margin down-curved, and rounded when young, occasionally uplifted in age. Surface dry to moist, smooth to appressed-fibrillose on disc. Pale pinkish buff to pinkish buff, at times with darker cinnamon buff colors, more rarely dingy creamy buff to cream-colored. **PERIDIUM** attached to stipe when young, typically breaking free, or partially to nearly completely disintegrating in age. **GLEBA** typically completely enclosed by the peridium when young, usually exposed when mature. Made up of highly convoluted gills, with numerous branched and intervenose veins, and honeycomb-like pits and hollows, giving it a loculate appearance. White when young, soon cream to pale yellow, to pinkish buff in age. **LATEX** often scant (unless fruit body is fresh and moist), white, unchanging, or slowly drying yellowish. **STIPE** 0.5–2 cm long, 0.5–1.5 cm thick, central to eccentric, reduced, equal or slightly bulbous. Surface dry, smooth, colored as cap. **FLESH** moderately thick, firm, breaking cleanly, white, cream to pinkish. Stipe solid to hollow. **ODOR** indistinct to strongly unpleasant. **TASTE** quickly strongly acrid. **MICROSCOPY:** **Spores** 7.5–10.6 x 5.5–8 μm , ellipsoid, ornamented with a partial to complete, strongly amyloid reticulum, with a rather large, conspicuous smooth plage. **Basidia** 35–47 x 9–15 μm , clavate, thin-walled, 4-spored. **Cystidia** 35–50 x 8–15 μm , ventricose to fusoid to subclavate, obscure, embedded in the hymenium, moderately thick-walled, hyaline in KOH and Melzer's reagent. **Trama** hyphae interwoven, lacking sphaerocysts; laticiferous hyphae present.

ECOLOGY: Solitary, scattered or in small clusters; fruit bodies partially buried, or more rarely completely buried in duff. Ectomycorrhizal, associated with firs (*Abies* spp.). Fruiting in late spring into fall, most common in early summer.

SIMILAR SPECIES: *Arcangeliella parva* is much smaller, has a reduced stipe and hypogeous habit. It has a white to pale yellow cap, a gleba which is completely enclosed, white latex and strongly acrid taste. Microscopically, it has slightly smaller (7.5–9.6 x 5.5–7 μm), ellipsoid to ovoid spores, ornamented with a strongly amyloid complete or broken reticulum.

Arcangeliella parva

Thiers

ALT. NAME: *Lactarius paulus* P.M. Kirk

COMMON NAME:

SPECIES CODE:



FAMILY: Russulaceae

SYNONYMS: *Gastrolactarius parvus* (Thiers) J.M. Vidal

SUMMARY: The small size, sequestrate habit, white to pale yellow cap and reduced stipe, a gleba which is completely enclosed, white latex, and acrid taste help distinguish *Arcangeliella parva*. Microscopically, it has ellipsoid to ovoid spores, ornamented with a strongly amyloid, complete or broken reticulum. Currently known from five locations, four around Yuba Pass in the northern Sierra Nevada, and one in the central Sierra Nevada, in Stanislaus National Forest.

TAXONOMIC NOTES: Described by Thiers (1984) from Sierra County, California, near Sattley. These sequestrate *Lactarius* have been called *Arcangeliella*. However, it's a fruit body form that has evolved multiple times within the genus *Lactarius*, and most species have been formally transferred to *Lactarius*. For ease of field taxonomy, calling them *Arcangeliella* helps distinguish them from their epigeous, mushroom relatives.

DISTRIBUTION: Only known from five locations in the central and northern Sierra Nevada in California, four of which are in the Yuba Pass area. **USA: CA: Sierra**

Co., TNF, north of Sattley on Highway 89 (Type). TNF, Lincoln Valley Road south of Yuba Pass. TNF, Yuba Pass. TNF, Turner Canyon, 4 miles east of Yuba Pass. **Tuolumne Co.**, StaNF, Douglas Flat Picnic area.

DESCRIPTION: **FRUIT BODY** roughly top-shaped, with a distinct (but reduced) stipe, and a peridium enclosing the gleba at all stages. **CAP** 0.7–2.2 cm across, convex when young, becoming broadly convex to plane, margin attached to stipe. Surface moist when fresh, often with stuck debris, smooth. White, creamy to pale yellow, remaining so in age, or developing grayish orange to brownish orange stains. **GLEBA** 0.2–0.3 cm thick, completely enclosed by peridium, convoluted, with crowded honeycomb-like to irregular locules. White, unchanging when exposed. **LATEX** white to watery-white, slowly drying pale yellow. **STIPE** 0.5–1.2 cm long, 0.3–0.6 cm thick, quite reduced, equal. White to pale yellow. **ODOR** indistinct. **TASTE** quickly strongly acrid. **MICROSCOPY:** **Spores** 7.5–9.6 x 5.5–7 μm , ellipsoid to ovoid, ornamented with a strongly amyloid, complete or broken reticulum, 0.25–0.5 μm high. Plage near hilar appendage smooth or with scattered amyloid ornamentation; apiculus hyaline, up to 2 μm long. **Basidia** 32–36 x 10–13 μm , clavate, 4-spored, (rarely 2-spored); sterigmata short, curved. **Cystidia** scattered to rare, 40–56 x 8–12 μm , fusoid with long tapering neck, thin-walled, hyaline. **Trama** composed of filamentous hyphae with no sphaerocysts apparent; laticiferous hyphae abundant. **Cap cuticle** differentiated as a compactly interwoven trichodermium with scattered free hyphal tips. **Pileus trama** of interwoven hyphae; sphaerocysts rare to absent; laticiferous hyphae abundant. **Clamp connections** absent.

ECOLOGY: Hypogeous, solitary or scattered, buried under duff and in soil under pines (*Pinus* spp.) and firs (*Abies* spp.). Ectomycorrhizal, associated with Pinaceae. Fruiting in spring and early summer.

SIMILAR SPECIES: *Arcangeliella saylorii* is very similar in size and stature, but has an orange to orange-brown cap, pale orange flesh, scant watery white latex, and smaller spores, 5.7–8.2 x 4.9–5.8 μm . *Arcangeliella crassa* is typically much larger and stockier, and has an off-white, creamy to pinkish buff cap, white latex (when fresh), a strongly acrid taste and slightly larger spores, 7.5–10.6 x 5.5–8.1 μm .

Photo: © Daniel L. Luoma.

Arcangeliella saylorii

Thiers

ALT. NAME: *Lactarius saylorii* (Thiers) P.M. Kirk

COMMON NAME:

SPECIES CODE:

FAMILY: Russulaceae

SYNONYMS: *Gastrolactarius saylorii* (Thiers) J.M. Vidal

SUMMARY: The small size, sequestrate, rounded to top-shaped fruit bodies with a much-reduced stipe, a pale orange to orange-brown cap, and a grayish orange highly convoluted gleba exuding watery white latex when fresh, help distinguish *Arcangeliella saylorii*. Microscopically, it has small globose to subglobose spores, ornamented with an amyloid, partial to complete reticulum. The description is derived from Thiers (1984), based on a single collection. More collections will likely lead to variation in the description. Currently known from a single location, in Eldorado National Forest.

TAXONOMIC NOTES: Described by Thiers (1984) from El Dorado County, California. These sequestrate *Lactarius* have been called *Arcangeliella*. However, it is a fruit body form that has evolved multiple times within the genus *Lactarius*, and most species have been formally transferred to *Lactarius*. For ease of field taxonomy, calling them *Arcangeliella* helps distinguish them from their epigeous relatives. Field identification of *Arcangeliella* species is not very reliable, as the main species differences are found among microscopical characters.

DISTRIBUTION: Known from only the type location, in Eldorado National Forest, in the north-central Sierra Nevada. **USA: CA: El Dorado Co.,** ENF, China Flat Campground, near Silver Fork Road (Type).

DESCRIPTION: **FRUIT BODY** rounded to top-shaped, with a much-reduced stipe, and a peridium enclosing the gleba at all stages. **CAP** 0.4–0.7 cm across, rounded to convex when young, becoming broadly convex to nearly plane, margin attached to stipe at all stages. Surface smooth, moist to dry. Pale orange to orange-brown. **GLEBA** rather narrow (0.1–0.2 cm thick) of highly convoluted gills, with numerous branched and intervenose veins, with honeycomb-like pits and hollows, giving it a loculate appearance. Grayish orange, unchanging when cut. **LATEX** scant, quickly reabsorbed, so often not noticeable. Watery white, unchanging when exposed, not staining tissue. **STIPE** 0.1–0.3 cm long, 0.1–0.2 cm thick, small and much reduced, continuing through the gleba when cross-sectioned. Surface dry, often with binding debris, brownish orange in color. **FLESH** thin, pale orange. **ODOR** unknown. **TASTE** unknown. **MICROSCOPY:** **Spores** 5.7–8.2 x 4.9–5.8 μm ,

globose to subglobose, ornamented with a partial to complete amyloid reticulum. Hilar plage present, relatively large, frequently with low amyloid granules; apiculus oblique, hyaline, lacking an amyloid collar. **Basidia** 35–47 x 7–10 μm , clavate, pale yellowish orange in Melzer's reagent, hyaline in KOH. Sterigmata curved, up to 3.3 μm long. **Cystidia** 45–64 x 7–9 μm , conspicuous and projecting beyond basidia, scattered, clavate with long tapered necks, often with two to four constrictions, or filiform with pointed tips. **Trama** of gleba interwoven; sphaerocysts and laticiferous hyphae not seen. **Cap cuticle** composed of irregularly flattened, filamentous, non-gelatinous hyphae. **Pileus trama** interwoven, with numerous nests of sphaerocysts; laticiferous hyphae abundant. **Clamp connections** absent.

ECOLOGY: Hypogeous, scattered or clustered, buried in loose sandy and rocky soil. Ectomycorrhizal, fruiting under White Fir (*Abies concolor*) in summer.

SIMILAR SPECIES: *Arcangeliella parva* is similar in size and stature, or with a slightly more developed stipe. It has a white to pale yellow cap, a gleba which is completely enclosed, white latex and strongly acrid taste. Microscopically, it has larger, (7.5–9.6 x 5.5–7 μm) ellipsoid to ovoid spores, ornamented with a strongly amyloid, complete or broken reticulum. *Arcangeliella crassa* is typically much larger and stockier. It has an off-white, creamy to pinkish buff cap, white latex, a strongly acrid taste and larger spores; 7.5–10.6 x 5.5–8.1 μm .

Arrhenia lobata

(Pers.) Kühner & Lamoure ex Redhead

COMMON NAME:

SPECIES CODE: ARLO15



FAMILY: Hygrophoraceae

SYNONYMS: *Cantharellus lobatus* (Pers.) Fr., *Corniola lobata* (Pers.) Gray, *Dictyolus lobatus* (Pers.) Quél., *Leptoglossum lobatum* (Pers.) Ricken, *Leptotus lobatus* (Pers.) P. Karst., *Merulius lobatus* Pers., *Merulius lobatus* var. *crenatus* Pers., *Merulius muscigenus* var. *lobatus* (Pers.) Sw.

SUMMARY: A small pale gray-brown mushroom with a lateral stipe, lobed, wavy cap, and reduced, intervenose gills. Grows on moss in high-elevation bogs, fens, and along mossy streambanks. Known from two sites in California, both in the northern Sierra Nevadas.

TAXONOMIC NOTES: Described by Persoon (1801) as *Merulius lobatus*, transferred by Redhead (1984) into the genus *Arrhenia*, where it resides today.

DISTRIBUTION: Widespread in the Arctic, occasional in alpine areas in the Rocky Mountains, rare in the Cascades and Sierra Nevada. Only known from two sites in California in the northern Sierra Nevada. Also reported from a few scattered sites in eastern North America. Known from Greenland, Iceland, and the Faeroe Islands, and occurring across northern Eurasia, in the Alps, the Carpathian

Mountains, and the Ilgaz-Mountains in Turkey. **USA: CA: Plumas Co.**, PNF, Beckworth RD, near road 24N76Y at 'Old House Fen'. **Sierra Co.**, TNF, off "Rim Loop" Road, off Weber Lake Road, south of Yuba Pass. **OR:** 1 site. **WA:** 5 sites. **ID:** 1 site. **MT:** 2 sites. **UT:** 1 site. **WY:** 1 site. **CO:** 13 sites. **AK:** ~35 sites. **CANADA: BC:** 1 site. **AB:** 7 sites.

DESCRIPTION: CAP 0.5–4 cm across, irregular rounded, fan-shaped or kidney-shaped, occasionally funnel-shaped, margin usually lobed, incurved at all stages. Surface smooth to wrinkled, moist to dry. Light gray-brown to grayish yellow, or buff; hygrophanous, fading when dry. **GILLS** present as thin decurrent veins at first, soon becoming more or less radially arranged, with often forking primary veins, and numerous shallow, anastomosing lateral veins. Light gray-brown to grayish yellow, or buff; often paler than cap. **STIPE** poorly formed, often reduced, off-center or lateral, base with whitish mycelium. Whitish or concolorous with cap. **FLESH** thin, membranous, soft and often elastic. **ODOR** indistinct. **TASTE** indistinct. **SPORE DEPOSIT** scant, whitish. **MICROSCOPY:** Spores 5–10 (15) x 4–8.5 μm , highly variable in shape; ellipsoid to oval, varying to tear-shaped, pear-shaped, amygdaliform or subglobose to globose, with a conspicuous blunt apiculus, smooth, inamyloid, thin-walled, hyaline. **Basidia** 20–39 x 6–8.5 μm , clavate, 2- or 4-spored, clamped, nearly colorless at top, typically with a brownish base. **Pleurocystidia** and cheilocystidia absent. **Clamp connections** present.

ECOLOGY: Nutrition mode unknown; likely a parasite on bryophytes. Fruiting solitary or clustered on creeping pleurocarpous mosses in wet areas; bogs, fens, saturated moss on streambanks, or alpine moss mats. Fruiting from spring into fall.

SIMILAR SPECIES: *Arrhenia retiruga* has pallid grayish colors, has a smooth underside when young, is finely veined in age, and often grows on elevated moss stems (although can grow from creeping moss mats). Microscopically, it has narrower spores; 6–9 (11) x 3–5 μm , and lacks clamp connections. *Arrhenia acerosa* has distinct, blade-like gills, darker gray colors and typically grows on small woody debris or soil (rarely on moss), and has shorter spores; 5–9 x 4–5.5 μm . *Rimbachia bryophila* also has more distinct gills with numerous cross veins, is completely white and grows on moss, often on banks and other vertical substrates.

Photo: © Diane McIvor.

Baeospora myriadophylla

(Peck) Singer

COMMON NAME: Lavender Baeospora

SPECIES CODE: BAMY3



FAMILY: Marasmiaceae

SYNONYMS: *Agaricus myriadophyllus* Peck, *Collybia myriadophylla* (Peck) Peck, *Mycena myriadophylla* (Peck) Kühner

SUMMARY: A relatively small mushroom with a lavender to lilac-gray cap that becomes buff in age, very crowded purplish gills, a cartilaginous stem, and it grows on wood. Widespread across northern North America, rare in California; currently known from three voucher-confirmed locations.

TAXONOMIC NOTES: Described by Peck (1873) as *Agaricus myriadophyllus*. Singer (1938) transferred it into the current genus, *Baeospora*.

DISTRIBUTION: Widespread, but uncommon across much of North America; also reported from montane regions of Europe. Rare in California; known from the southern Cascades and northern Sierra Nevada, and reported from the northern coast. **USA:** CA: Siskiyou Co., S-TNF, Bartle Creek. Sierra Co., TNF, Yuba Pass. TNF, Highway 49, 2 miles east of Yuba Pass. WA: 18 sites. ID: 6 sites. MT: 2 sites. CO: 3 sites. **CANADA:** BC: 5 sites. AB: 2 sites.

DESCRIPTION: **CAP** 1–2.5 cm across, convex to broadly convex at first, becoming plane, margin incurved at first, becoming wavy. Surface smooth, moist to dry, covered with a whitish bloom when young, becoming glabrous. Lavender to lilac-gray when young, becoming lilac-brown to grayish brown in age, fading to grayish tan or buff when dry. **GILLS** attached, very crowded, narrow; partial gills numerous. Purplish, lilac to lilac-gray when young, becoming purplish brown to purplish gray in age. **STIPE** 1.5–6 cm long, 0.1–0.4 cm thick at apex, equal; surface dry, powdery when young, becoming smooth; base covered with coarse to tomentose hairs. Purplish, lilac to lilac-gray and covered with a powdery white bloom when young, becoming purplish brown to grayish in age. **FLESH** thin, cartilaginous in stipe. **ODOR** fungal. **TASTE** indistinct. **SPORE DEPOSIT** whitish. **MICROSCOPY:** **Spores** 2.5–4.5 x 2–3 μm , rounded-ellipsoid, smooth, weakly amyloid. **Basidia** 15–17.5 x 3.5–4.5 μm , clavate, 4-spored. **Pleurocystidia** numerous, 17–27 x 4–7 μm , projecting 5–13 μm , broadly clavate or ventricose, hyaline to pale yellow, inamyloid, thin-walled; basal portion encrusted with brown, weakly dextrinoid pigment incrustations **Cheilocystidia** similar, abundant on gill edge. **Pileipellis** a 10- μm -thick layer of nongelatinized, inamyloid hyphae above an undifferentiated subpellis.

ECOLOGY: Saprobic, fruiting solitary or scattered on decaying logs. Although it seems to prefer dead alder (*Alnus* spp.) and maple (*Acer* spp.) logs on the North Coast, collections from the mountains have been on rotting *Abies* logs. Fruiting in late spring and fall.

SIMILAR SPECIES: *Chromosera cyanophylla* has a viscid yellow cap and stipe, and has distinctly decurrent, widely spaced, amethyst gills. *Baeospora myosura* also has crowded gills, but is smaller, lacks any purple tones, and grows directly on conifer cones. *Mycena pura* and *Pseudobaeospora deckeri* also share purplish colors, but grow in duff, not on wood. *Connopus acervatus* grows in dense, often large clusters and has pallid gills.

Calocybe naucoria

(Murrill) Singer

COMMON NAME:

SPECIES CODE:



FAMILY: Lyophyllaceae

SYNONYMS: *Rugosomyces naucoria* (Murrill) Boffelli, *Melanoleuca naucoria* Murrill, *Tricholoma naucoria* (Murrill) Murrill, *Agaricus fallax* Peck (nom. illegit.), *Calocybe fallax* Singer (nom. inval.), *Calocybe fallax* Redhead & Singer (nom. illegit.), *Lyophyllum fallax* Kühner & Romagn. (nom. inval.), *Rugosomyces fallax* Bon (nom. illegit.), *Tricholoma fallax* Sacc. (nom. illegit.)

SUMMARY: The small size, yellow to yellow-orange colors, close to crowded gills, pruinose stipe apex, and white spores help distinguish *Calocybe naucoria*. Rare in California, only known from four locations.

TAXONOMIC NOTES: Described from western New York, Peck (1873). No genetic studies have been done comparing western collections with the eastern species; they may differ. Also recorded from Europe, which may represent a third taxon. The naming history of this species is full of mishaps. Better known as *Calocybe fallax* (or *Rugosomyces fallax*), the commonly accepted valid and legitimate name is *Calocybe naucoria*. The genus *Rugosomyces* falls within *Calocybe*.

DISTRIBUTION: Widespread across the mountains of western North America from

California to Alaska, but rare except for pockets in the Rocky Mountains. Also occurring across northcentral and northeast North America. Currently only known from five collections (four locations) in California, three of which are historic. **USA: CA: Del Norte Co.**, near Crescent City. Location unknown; listed as “Siskiyou National Forest”; likely SRNF, Smith River National Recreation Area. **Siskiyou Co.**, KNF, Marble Mountains. **El Dorado Co.**, LTBMU, near Grass Lake. **OR:** 3 sites. **WA:** 14 sites. **ID:** 2 sites. **WY:** 3 sites. **CO:** 17 sites. **AZ:** 2 sites. **NM:** 7 sites. **CANADA: BC:** 1 site. **Northcentral/Northeast North America:** 50+ sites.

DESCRIPTION: CAP 0.5–3 cm across, convex to broadly convex with an incurved margin at first, becoming plane or centrally depressed in age. Surface moist to dry, smooth when young, slightly textured in age. Orange-yellow, yellow to yellow-brown; hygrophanous, at times darker, orange-brown in age when wet, pale when dry. **GILLS** narrowly attached, with an abrupt, deep notch, close to crowded, narrow. Light yellow, yellow-orange to brownish yellow. **STIPE** 1.5–4 cm long, 0.1–0.5 cm thick, equal. Surface dry, apex pruinose when young, smooth in age, base often with whitish to yellow fibrils. Yellow to orange-yellow, occasionally with reddish tones in age, pruin brighter yellow. **FLESH** thin, light yellow. Stipe fibrous, solid when young, hollow in age, yellow to brownish yellow. **ODOR** indistinct. **TASTE** mild. **SPORE DEPOSIT** white. **MICROSCOPY:** **Spores** 3.5–5 x 2.5–3 μm , ellipsoid, smooth, thin-walled, inamyloid, hyaline. **Basidia** 15–20 x 4–6 μm , cylindric to narrowly clavate, thin-walled. **Pleurocystidia** and **cheilocystidia** absent. **Cap cuticle** of clavate cells, 8–22 x 5–10 μm , light yellow in KOH. **Clamp connections** present.

ECOLOGY: Solitary, scattered, or in gregarious patches, fruiting in summer and fall. Saprobic on duff of conifers and Quaking Aspen (*Populus tremuloides*); typically binding the surrounding duff with hyphae.

SIMILAR SPECIES: *Calocybe onychina* has a purple cap when young, aging purple brown to orange-brown, and has yellow gills. It fruits in the spring in the mountains, soon after snowmelt, (rarely in fall on the coast). Some *Gymnopilus* species look similar, but are easily distinguished by their rusty orange spores. Similar looking *Pholiota* species have a viscid cap cuticle and brown spores. The white-spored *Callistosporium luteo-olivaceum* grows on decaying wood, has more olive-yellow colors, and a distinct red KOH reaction. *Xeromphalina* species are often much smaller, and have thin, often wiry stipes. *Flammulina populicola* often grows in clusters from the base, or roots of dead and dying aspen. It typically has a two-toned yellowish to brownish, viscid to moist cap, and an often dark velvety lower stipe.

Cantharocybe gruberi

(A.H. Sm.) H.E. Bigelow & A.H. Sm.

COMMON NAME:

SPECIES CODE:



FAMILY: Hygrophoraceae

SYNONYMS: *Clitocybe gruberi* A.H. Sm., *Laccaria gruberi* (A.H. Sm.) Singer

SUMMARY: A medium-sized to large mushroom with a creamy to yellowish cap, thick, decurrent gills, and large, oblong to nearly cylindrical spores and abundant cheilocystidia. Little is known about the habitat preferences of this species; most records are from spring in conifer forests; one record is from late summer.

TAXONOMIC NOTES: Described by Smith (1944) based on a collection made in Idaho. Later made the type of the genus *Cantharocybe* Bigelow (1973). Collections from Spain are a 98% match to a partial ITS sequence from a North American collection. More study is needed to see if they are conspecific.

DISTRIBUTION: Widespread in the western mountains, but only known from 11 voucher-confirmed locations. Known from three locations (vouchered collections), and a few additional photo records in California. Also known from the Cascades in Oregon and Washington, the northern Rocky Mountains, and New Mexico and Arizona. It has also been reported from Spain. **USA:** **CA:** Siskiyou Co., S-TNF, off FS Road 49. S-TNF, near McCloud (unconfirmed). **Sierra Co.,** TNF, Cot-

tonwood Creek Campground. Green Acres. **El Dorado Co.**, ENF, Pipi Valley (unconfirmed). **OR:** 1 site. **WA:** 2 sites. **ID:** 2 sites. **AZ:** 1 site. **NM:** 2 sites. **CANADA:** **BC:** 1 site.

DESCRIPTION: **CAP** (4) 8–20 cm across, rounded to convex at first, becoming broadly convex; margin inrolled when young, often staying downcurved, occasionally wavy or lobed. Surface dry, tomentose at the edge when young, soon smooth. Cap often developing superficial areolate cracks in dry or hot weather. Cream-yellow to pale yellow at first, darkening or drying to darker yellow, occasionally with grayish or brown tones in age. **GILLS** broadly attached to deeply decurrent, sometimes markedly anastomosing or forming a reticulum on stipe apex, close to well-spaced, rather thick, waxy. Creamy white to pale yellow at first, typically yellowing on edges in age. **STIPE** 2–5 cm long, 1.5–3 cm thick, central to off-center, often short and stout, equal or bulbous, typically tapered at base. Surface dry, smooth. Creamy white to pale yellow, discoloring yellowish in age. **FLESH** thick, firm. White with yellow tones in cap or in age. **ODOR** often sweet and fruity, sometimes radish-like. **TASTE** pleasant, mild to sweet. **SPORE DEPOSIT** white. **MICROSCOPY:** **Spores** 11–16 (17.5) x (4.5) 6–7.5 μm , ellipsoid, oblong to subcylindrical, smooth, inamyloid. **Basidia** 37–60 x 7–12 μm , 4-spored. **Cheilocystidia** abundant; 33–75 x 4–7.5 (10) μm , lageniform to lecythiform (with a swollen base and tapered, often slender necks, or bowling-pin shaped), with apices branched at times, colorless, thin-walled, smooth. **Pleurocystidia** rare, similar to cheilocystidia. **Clamp connections** present.

ECOLOGY: Typically solitary, more rarely in small clumps, growing from duff and soil, sometimes near decaying wood; always near conifers, perhaps most frequently with pines. Fruiting in spring and early summer, more rarely in fall. Nutritional mode unknown.

SIMILAR SPECIES: *Hygrophorus subalpinus* has brighter white colors, an evanescent partial veil, softer flesh and grows on the edges of melting snowbanks. Microscopically, it (and other *Hygrophorus* species) have smaller, ellipsoid spores. *Leucopaxillus albissimus* is typically larger, with crowded gills, a bitter taste, and smaller, distinctly amyloid-warted spores. *Clitocybe* species have crowded gills, often thinner flesh and smaller, ellipsoid spores.

Photo: © Michael Wood.

Chroogomphus albipes

(Zeller) Y.C. Li & Zhu L. Yang

COMMON NAME:

SPECIES CODE: BRAL13



FAMILY: Gomphidiaceae

SYNONYMS: *Brauniellula albipes* (Zeller) A.H. Sm. & Singer, *Secotium albipes* Zeller, *Brauniellula nancyae* A.H. Sm. & Singer

SUMMARY: This sequestrate species is recognized by the rounded to irregularly lobed cap, with a margin attached to a much-reduced stipe when young, separating slightly when mature, but remaining down-curved at all stages. The ochre to pale orange cap is partially to extensively covered with grayish to brownish gray fibrils when young, becoming vinaceous to purplish red overall in age. The highly convoluted, loculate gleba starts off ochraceous to pale orange, soon becoming darker, grayish orange to nearly black when spores mature. Reported as “abundant” in California by Thiers (1979), who said about the now synonymous *Brauniellula nancyae* “Abundant throughout the Sierra Nevada where it is commonly associated with lodgepole pines (*Pinus contorta* ssp. *murrayana*). Less common but widespread and associated with the same mycorrhizal host in other mountain ranges within the state.” Only three collections have been made in the past 30 years, and three observations have been reported on Mushroom Observer. In total, known from 16 sites in California, and ~70 sites elsewhere in western North

America, mostly in the Rocky Mountains.

TAXONOMIC NOTES: First described by Zeller in 1948, from a collection made in Butte County, California, (near Merrimac) as *Secotium albipes*. Later transferred to the genus *Brauniellula* (Smith & Singer 1958), who also described *Brauniellula nancyae*. Miller (2003) synonymized *B. nancyae* with *B. albipes*, and stated it belonged in the genus *Chroogomphus*, but did not formally transfer it. Li et. al (2009) made the transfer to *Chroogomphus*, after the name *Chroogomphus* was conserved against *Brauniellula* (the older name).

DISTRIBUTION: Widespread in western North America, mostly in montane habitat, occasionally in coastal pine forest. Uncommon from southern California into British Columbia, locally common in the Rocky Mountains. Currently known from 16 sites in California. **USA: CA: Siskiyou Co.**, S-TNF, Military Pass Road near Mount Shasta. **Mendocino Co.**, near Mendocino. **Lake Co.**, MeNF, Boardman Ridge. **Butte Co.**, PNF, Merrimac (Type). **Sierra Co.**, TNF, Chapman Creek Campground. TNF, Yuba Pass. TNF, Highway 89, 7 miles north of Hwy 49. TNF, Haskell Creek. **Amador Co.**, ENF, 2 miles east of Silver Lake. **Alpine Co.**, ENF, Carson Pass. **Inyo Co.**, INF, Mammoth Mountain, ski lift area. **Calaveras Co.**, Calaveras Big Trees State Park, campground. **Mariposa Co.**, YNP, Wawona, Livingston House. **Fresno Co.**, SieNF, Dinkey Creek Campground. SieNF, Huntington Lake. **San Bernardino Co.**, SBNF, Black Mountain Campground. **OR:** 5 sites. **WA:** 5 sites. **Rocky Mountains:** ~60 sites.

DESCRIPTION: **CAP** (0.5) 1–5 cm across, roughly rounded to convex, often irregularly lobed or flattened, margin irregular, connected to stipe by a fibrillose veil well into maturity, becoming free when old, but remaining downcurved. Surface slightly viscid when wet, otherwise dry, appressed-fibrillose to nearly smooth. Ochre to pale orange base color, covered with grayish to brownish gray fibrils, becoming vinaceous to purplish red in age. **GLEBA** completely enclosed when young, slightly exposed in age, composed of highly convoluted, loculate, small chambers. Ochre to pale orange when young, becoming darker, grayish orange, grayish to nearly black when spores mature. **STIPE** 0.3–2 cm long, 0.5–1 cm thick, much reduced, equal or narrowed downward. Ochraceous when young, at times streaked with ochraceous to vinaceous veil fibrils, developing vinaceous tones in age. **PARTIAL VEIL** fibrillose, ochraceous when young, becoming vinaceous. **FLESH** thick, firm, ochraceous to ochraceous orange when young, ochraceous brown when mature. **ODOR** indistinct. **TASTE** indistinct. **SPORE DEPOSIT** not obtainable. **MICROSCOPY:** **Spores** 16–20 x 6.5–9 μm , ellipsoid, smooth, wall slightly thickened, honey-brown in KOH, dark red-brown in Melzer's reagent. **Basidia** 44–52 x 9–12 μm , 4-spored, hyaline, often with granular content when fresh in KOH, dull orange-

brown to yellowish in Melzer's reagent. **Cystidia** abundant, 100–150 x 14–26 μm , subventricose to subcylindric, with tapered necks with an obtuse or subacute apex, thin-walled; vinaceous red in KOH, yellowish in Melzer's reagent. **Trama** hyphae 4–8 μm wide, thin-walled, subparallel and curving out slightly to an interwoven subhymenium, with scattered incrusting particles. **Cap cuticle** hyphae 4–5 μm wide, radially arranged, with reddish incrusting particles in KOH. **Clamp connections** absent.

ECOLOGY: Solitary, scattered, or in fused clusters in soil or duff. *Chroogomphus* in general are associated with ectomycorrhizal *Suillus* species, likely as myco-parasites of those taxa. Most collections come from higher elevation Lodgepole Pine (*Pinus contorta* ssp. *murrayana*) forests in California, possibly associated with three-needle pines as well. Fruiting in summer and fall.

SIMILAR SPECIES: *Chroogomphus loculatus* has highly deformed, often loculate gills, but caps are typically open when mature, and it grows with hemlock (*Tsuga*).

Chroogomphus loculatus

Trappe & O.K. Mill.

COMMON NAME:

SPECIES CODE: CHLO2



FAMILY: Gomphidiaceae

SYNONYMS: *Gomphidius loculatus* (Trappe & O.K. Mill.) Kotl. & Pouzar

SUMMARY: *Chroogomphus loculatus* is a sequestrate species with highly deformed, loculate or lamellate gills, a pale orange to yellowish ochre cap, covered with darker, smoky olive fibrils and scales, a rather long, and often tapered stipe, and a smoky black spore deposit. Microscopically, it has large (15–30 x 6–9 μm) ovate to elongate-ovoid spores, and very large, thick-walled cystidia up to 260 μm long.

TAXONOMIC NOTES: Described by Miller and Trappe (1970) from a collection made in Lane County, Oregon. Miller (2003) stated “Taxonomic evaluation is needed; as there is some question if it is an environmental variation *Chroogomphus tomentosus*”. Modern collections and more genetic sequences should be compared. The single California collection should also be questioned, as it was growing in a location that lacked hemlock (*Tsuga*) and had a highly irregular fruit body.

DISTRIBUTION: Known from five sites in the Cascade mountains in central and southern Oregon, and northern California. **USA: CA: Siskiyou Co.**, S-TNF, near Harris Spring. **OR: Lane Co.**, Willamette National Forest, Lamb Butte Scenic

Area, along trail to Potholes Creek (Type). Willamette National Forest, Lamb Butte Scenic Area. Willamette National Forest Waldo Lake Trail. Willamette National Forest, Hand Lake Trail.

DESCRIPTION: CAP 2.5–7 cm across, convex to broadly convex; margin inrolled when young, often fully expanding in age. Surface dry, with appressed or flattened fibrillose scales. Pale orange to yellowish ochre, covered with darker, smoky olive fibrils and scales. **GILLS/GLEBA** decurrent, highly irregular, with numerous cross-veins, forming irregular locules. Pale pinkish at first, becoming brownish orange when mature. **STIPE** 2.5–8 cm long, 1.5–3.5 cm thick at apex, tapering downward to a pointed base, or with a swollen middle, tapering below. Pale orange or vinaceous blushed above annular zone, pallid to yellowish, streaked with olivaceous veil fibrils below. **PARTIAL VEIL** fibrillose, disappearing or leaving an obscure annular zone. **FLESH** moderately thick, fleshy, pale orange, often with olive stains in lower stipe. **ODOR** unknown. **TASTE** unknown. **SPORE DEPOSIT** smoky black. **MICROSCOPY:** Spores (15) 19–30 x 6–9 μm , ovoid to elongate-ovoid in face view, somewhat spindle-shaped in side view, smooth, moderately thick-walled, brown-black in KOH, with deep red, ochraceous to yellow contents in Melzer's reagent. **Basidia** 48–72 x 11–15 μm , clavate, thin-walled, 4-spored; hyaline in KOH and Melzer's reagent. **Pleurocystidia** and **cheilocystidia** abundant, 108–200 (260) x (13) 17–29 μm , protruding 1/2–2/3 from hymenium, nearly cylindrical, elongate fusiform to elongate clavate, with thin to thick (up to 3 μm) walls. Hyaline to light yellowish in Melzer's reagent, occasionally partially covered with dingy yellow-brown incrustated material. **Clamp connections** absent.

ECOLOGY: Hypogeous to emergent, solitary, scattered or in fused clusters in soil or duff. *Chroogomphus* species in general are associated with ectomycorrhizal *Suillus* species and *Aureoboletus mirabilis*, likely as myco-parasites of those taxa. Known from mid to high-elevation forest with hemlock (*Tsuga* spp.) and Douglas-fir (*Pseudotsuga menziesii*), fruiting in fall.

SIMILAR SPECIES: *Chroogomphus tomentosus* has a beige-orange to buff-orange cap, young gills and stipe. It differs by having widely spaced, thick-edged decurrent gills which are not deformed or loculate; it is phylogenetically very close to *Chr. loculatus*. *Chroogomphus albipes* has a rounded or lobed 'cap' that never opens up, and a highly convoluted, loculate gleba, with only rarely gets exposed on the lower edge. It has an ochre-orange cap when young, developing vinaceous brown colors in age.

Photo: © Michael Castellano.

Chrysomphalina grossula

(Pers.) Norvell, Redhead & Ammirati

COMMON NAME:

SPECIES CODE: CHGR23



FAMILY: Hygrophoraceae

SYNONYMS: *Agaricus grossulus* Pers., *Agaricus umbellifer* var. *abiegnus* Berk. & Broome., *Camarophyllus grossulus* (Pers.) Clémençon., *Chrysomphalina grossula* var. *belleri* (Bon) P.-A. Moreau & Courtec., *Cuphophyllus grossulus* (Pers.) Bon., *Cuphophyllus grossulus* var. *belleri* Bon., *Gerronema grossulum* (Pers.) Singer., *Hygrocybe grossula* (Pers.) Pätzold & Laux., *Hygrophorus wynneae* Berk. & Broome., *Omphalia abiegna* (Berk. & Broome) J.E. Lange., *Omphalia bibula* (Quél.) Sacc., *Omphalia bibula* var. *citricolor* Rolland., *Omphalia umbellifera* var. *citrina* (Quél.) Sacc., *Omphalia wynneae* (Berk. & Broome) Quél., *Omphalina abiegna* (Berk. & Broome) Singer., *Omphalina bibula* Quél., *Omphalina grossula* (Pers.) Singer., *Omphalina umbellifera* var. *citrina* Quél., *Omphalina wynneae* (Berk. & Broome) S. Ito.

SUMMARY: A small mushroom with a greenish to greenish yellow cap that fades to 'cool' yellow in age, decurrent, well-spaced gills and which grows on wood. Rare in California; known from three locations (two coastal, one from 700 m.).

TAXONOMIC NOTES: *Chrysomphalina grossula* (and all synonyms) are based on European types. No genetic studies have been done to see if the western North American entity represents a distinct species.

DISTRIBUTION: Known from three sites in California; on the North Coast and one in the Coast Range. Likely also occurs in the Klamath Range, and potentially in the Sierra Nevada. Occurring from the coast to the Cascades in Washington and Oregon up to elevations of 1100 m. **USA: CA: Humboldt Co.,** Lord Ellis Summit. Arcata. **Mendocino Co.,** Caspar. **OR:** 6 sites. **WA:** 10 sites.

DESCRIPTION: **CAP** (0.2) 0.6–3.5 (6) cm across, convex to broadly convex with an incurved margin when young, becoming plane with a depressed center, to up-lifted in age. Surface moist to dry, smooth, hygrophanous, translucent-striate from margin to disc when wet. Young caps typically greenish, greenish yellow to yellow, at times with brownish yellow tones, soon fading to yellow or citron yellow, to pale yellow or whitish in age. **GILLS** decurrent to deeply decurrent, moderate to widely spaced, thick, broad. Yellowish to greenish yellow, becoming pale yellow to whitish in age. **STIPE** 0.5–4 cm long, 0.1–0.4 (1) cm thick, equal or enlarged at apex, narrowing towards base. Surface moist to dry, smooth or minutely pubescent. Greenish yellow to yellow, paler towards base and in age. **FLESH** thin, concolorous, stipe hollow. **ODOR** indistinct. **TASTE** indistinct. **SPORE DEPOSIT** scant, whitish. **MICROSCOPY:** **Spores** 5.9–9.6 x 3.7–5.5 (6) μm , ellipsoid to subellipsoid, with conspicuous apiculus, smooth, inamyloid, thin-walled, hyaline, often one central oil droplet. **Basidia** 33–48 x 5–8 μm , cylindrical to narrowly club-shaped, 4-spored, (rarely 2-spored). **Pleurocystidia** and **cheilocystidia** absent. **Pileipellis** a cutis of compact parallel to subparallel cylindrical, septate hyphae (3) 6–13 μm thick, smooth, thin-walled. **Clamp connections** absent.

ECOLOGY: Saprobic; with solitary, scattered or small clusters of fruiting bodies on decaying wood, wood chips or bark. Often occurring in coastal and Cascade forests with hemlock (*Tsuga*) but has also been found in urban areas on wood chips. Fruiting in fall and winter.

SIMILAR SPECIES: *Lichenomphalia umbellifera* is very similar in size and stature but has a light beige or pinkish buff to light brown cap when young. It fades to creamy beige with age, but typically retains a vinaceous tint to the stipe apex. It lacks greenish and greenish yellow colors and grows from a dark green mat of algae (usually on rotting wood, sometimes on wet ground). *Chrysomphalina chrysophylla* has a warm brown to golden orange cap, and bright chrome yellow to orange gills, fading only slightly in age. *Chrysomphalina aurantiaca* has a bright orange cap when young which fades to yellowish orange or creamy orange in age. *Chromosera cyanophylla* has a viscid yellow cap and stipe, lilac gills when young (fading to yellow in age) and violet mycelium at the stipe base. It's common in the California mountains soon after snowmelt in spring on decaying conifer logs and bark.

Cortinarius cyanites sensu western North America

COMMON NAME:

SPECIES CODE: COCY8



FAMILY: Cortinariaceae

SYNONYMS: See Taxonomic Notes.

SUMMARY: A stout mushroom recognizable by its relatively large size, a bluish lilac cap that develops dark streaks, bluish lilac to grayish brown gills, and reddish to vinaceous staining flesh. No other *Cortinarius* species in California shares these features. Currently known from nine sites in California, on the North Coast, Cascades and Sierra Nevada.

TAXONOMIC NOTES: Based on DNA sequencing, the western North American taxon going by this name is distinct from the ‘true’ (=European) *Cortinarius cyanites*. It also appears to be distinct from the eastern North American *Cortinarius “cyanites”* as well. Until our species is described, we will continue to use the European name to maintain continuity of records.

DISTRIBUTION: Scattered throughout the Sierra Nevada and Cascade Range, and on the coast from Mendocino County northwards into Alaska. Also reported from the Rocky Mountains, but these collections should be critically examined, and especially compared genetically to California collections. **USA: CA: Del Norte Co.,** Jedediah Smith Redwood State Park. **Humboldt Co.,** RNP, Davison Rd.

Trinidad, Trinidad Beach State Park. **Mendocino Co.**, Navarro, Navarro State Park, James A. Jones Grove. Jackson State Forest near Mendocino. **Siskiyou Co.**, S-TNF, Trout Creek. **Nevada Co.**, TNF, Skillman Horse Campground. **Tuolumne Co.**, StaNF, Pinecrest. YNP, along Tioga Pass Rd. **OR**: 2 sites (photo records only). **WA**: 11 sites. **AK**: 3 sites. **CANADA**: **BC**: 9 sites.

DESCRIPTION: **CAP** 6–15 cm across, rounded to convex when young, expanding to broadly convex to plane or wavy. Margin down-curved at first, becoming wavy and slightly uplifted in age. Surface dry to slightly viscid when wet, covered with radiating streaks of appressed fibrils. Color highly variable. Bluish in the button stage, becoming bluish purple and developing dark brown streaks. As it ages, the purple tones usually darken to dark grayish brown or purplish brown. **GILLS** broadly to narrowly attached, often with a distinct notch, close to crowded, broad. Bluish to bluish violet at first, becoming lilac-gray and eventually darkening to deep lilac gray or gray-brown. Staining vinaceous red when damaged. **STIPE** 6–15 (18) cm long 1–2.5 cm thick at the apex, club-shaped or swollen with an elongated bulbous base, 1.5–4.5 cm thick. Surface dry, covered with silky fibrils that become matted in age. Bluish lilac to pale violet at first, fading to gray and then darkening to dingy gray to grayish lilac and developing dingy brown color from the base up. Staining bright violet when handled, these stains slowly turn vinaceous red and then deep purple. **CORTINA** leaving an annular zone of lilac fibrils on the stipe, becoming grayish and then rusty brown from the spores. **FLESH** thick, firm, fleshy. Bluish lilac at first, fading to grayish lilac, staining red to vinaceous red, especially in the stipe base. **ODOR** indistinct. **TASTE** indistinct to slightly bitter. **KOH** No reaction. **SPORE DEPOSIT** rusty brown. **MICROSCOPY:** **Spores** (8.5) 9–11.5 × 5–7 (7.5) μm ellipsoid to amygdaliform, distinctly roughened. **Basidia** (25) 35–50 × 8–11 (13) μm , 4-spored, clavate to broadly clavate, colorless to light yellow-brown. **Pleurocystidia** and **cheilocystidia** absent. **Clamp connections** present.

ECOLOGY: Ectomycorrhizal with conifers, likely with *Abies* in the California mountains. Most known sites are in old-growth forest, but it is unknown whether this species is restricted to such habitats. Fruiting in late summer and fall.

SIMILAR SPECIES: *Cortinarius occidentalis* (= *C. mutabilis*) has brighter purple colors, somewhat smaller fruit bodies, and stains purple on all damaged parts. Taxa in the *Cortinarius purpurascens* group typically have duller olive-tan or brown caps, and stain purplish on the gills and stipe. *Cortinarius violaceus* has a coarsely velvety cap and is entirely deep royal purple (to nearly blackish purple) in color.

Cortinarius luteicolor

Ammirati, Bojantchev, Niskanen & Liimat.

COMMON NAME:

SPECIES CODE:



FAMILY: Cortinariaceae

SYNONYMS: *Cortinarius orichalceus* var. *olympianus* f. *luteifolius* A.H. Sm.

SUMMARY: A medium to large mushroom with a viscid, deep dull yellow to yellow-olive cap when young, developing dull cinnamon color as it ages, pale yellow young gills, a bulbous stipe with yellow mycelium around the bulb. Currently known from six locations, one of which is in the southcentral Sierra Nevada in California.

TAXONOMIC NOTES: Described by Smith (1944) as *Cortinarius orichalceus* var. *olympianus* f. *luteifolius*, from near Lake Angeles, in Olympic National Park in Washington. Liimatainen et al. (2014) elevated it to species rank, as *C. luteicolor*. *Cortinarius* species are notoriously hard to identify, and this species is no exception. More collections are needed to aptly describe features and variability with *C. luteicolor*.

DISTRIBUTION: Widespread but scattered in small populations in the western mountains. **USA: CA: Tuolumne Co.,** YNP, Highway 120, near Tioga Pass. **OR:** 1 site. **WA: 2 sites. Clallam Co.,** Olympic National Park, near Lake Angeles (Type). **CANADA: BC: E.C. Manning Provincial Park,** Strawberry Flats.

DESCRIPTION: **CAP** 5–9 cm across, convex to broadly convex with an inrolled to downcurved margin when young, becoming nearly plane. Surface gelatinous when wet, smooth, appearing fibrillose-streaked beneath the gluten, often with small scales on disc if dry. Deep dull yellow, straw-yellow or yellow tinged with olive when young, developing dull cinnamon color on the disc, or more extensively in age. **GILLS** Broadly attached, or with a slight notch, close to crowded, narrow. Pale yellow when young, becoming olive-yellow, then dull rusty brown as spores mature. **STIPE** 5–7 cm long, 2–2.5 cm thick at apex, cylindrical to large basal bulb, up to 4 cm across. Surface dry, fibrillose from remains of cortina. Pale yellow at apex, dingy yellow towards base, discoloring slightly in age. Base covered with bright yellow mycelium. **CORTINA** moderately thick to scant, pale greenish yellow, leaving a silky annular zone on stipe. **FLESH** thick, firm, whitish, with a watery greenish line along the gills. **STIPE** solid, fibrous, whitish to pale olivaceous. **ODOR** indistinct. **TASTE** mild. **KOH** deep rusty red on cap, indistinct to reddish on flesh. **SPORE DEPOSIT** rusty brown. **MICROSCOPY:** **Spores** 9–11 x 6–7 μm , nearly amygdaliform, roughened or wrinkled, rusty brown. **Basidia** 4-spored. **Cystidia** absent.

ECOLOGY: Solitary or scattered; often in small patches in soil or duff. Ectomycorrhizal with conifers, and likely restricted to old-growth forest. Known from a single high-elevation site in the central Sierra Nevada in California and scattered mid- to high- elevation sites in the Cascades and Olympics in the Pacific Northwest. Fruiting in fall.

SIMILAR SPECIES: *Cortinarius pseudocupreorufus* has an olivaceous gray cap when young, becoming dark vinaceous brown in age, bright olive-green young gills, a lilac tint to the stipe apex, and pale olivaceous veil remnants.

Photo: © Dimitar Bojantchev.

Cortinarius olympianus

A.H. Sm

COMMON NAME:

SPECIES CODE: COOL4



FAMILY: Cortinariaceae

SYNONYMS: None

SUMMARY: A medium-sized mushroom distinguished by its “cool” violet to lilac cap that fades in age, pale lilac gills, an abruptly bulbous stipe, relatively stout stature, and a bright rosy pink KOH reaction on the cap. Uncommon to rare; appears to be restricted to old-growth conifer forests. Most California records come from the Klamath Mountains, with a single record from StaNF, in Tuolumne County.

TAXONOMIC NOTES: Described by Smith (1939) from Olympic Hot Springs, in Olympic National Park, Washington.

DISTRIBUTION: Known from a single site in the Sierra Nevada, scattered locations throughout the Klamath Range, continuing north in the Cascade and Olympic Mountains into southern British Columbia. **USA: CA: Siskiyou Co.**, KNF, (location not listed). KNF, trail to Haypress Meadow. KNF, Cub Creek. KNF, Canyon Creek Trail near Lovers Camp. KNF, start of Stanshaw Trail. KNF, Duck Lake Trailhead. **Tuolumne Co.**, StaNF, Pinecrest. **OR:** ~30 sites. (exact location not given on

many of collections). **WA:** ~20 sites. (exact location not given on many of collections). **ID:** 1 site. **CANADA: BC:** 1 site.

DESCRIPTION: CAP 3–7 (10) cm across, rounded to convex when young, becoming plane, margin inrolled at first, staying downcurved, eventually even. Surface smooth, slimy to viscid when wet, often with adhering debris if dry. Pale, cool violet to lilac to grayish lavender at first, fading to whitish lilac; occasionally developing yellowish tones in age. **GILLS** narrowly attached, often notched, close to crowded, narrow. Pallid in button stage, soon violet to lilac (retaining color well into maturity), with rusty stains from spores in age. **STIPE** 3.5–6 cm long, 0.8–1.5 cm thick at apex, cylindrical to abrupt basal bulb, 1.5–3 cm across, bulb tapering to base. Surface dry, covered with silky veil fibrils. Pale violet to lilac when young, fading and developing brownish stains in age. **CORTINA** moderately thick to scant, pale lilac to whitish, leaving a silky annular zone on stipe. **FLESH** moderately thick, firm, fleshy. White to pale grayish tan. **ODOR** indistinct. **TASTE** indistinct. **KOH** bright rosy pink on cap, darkening slightly on flesh. **SPORE DEPOSIT** rusty brown. **MICROSCOPY:** Spores 8–10 x 5–6 μm , amygdaliform to slightly limoniform, moderately roughened. **Pleurocystidia** and **cheilocystidia** absent. **Clamp connections** present.

ECOLOGY: Ectomycorrhizal with conifers; likely restricted to old-growth forests. Solitary or scattered, growing from soil or duff, often in small patches in mid- to high-elevation forests in California, rarely coastally. Fruiting in fall.

SIMILAR SPECIES: *Cortinarius perplexus* has a pale, creamy ochre cap that turns bright rosy pink with the application of KOH, pale grayish lilac gills that develop purple colors in age, and grows with oaks. *Cortinarius lilaciotinctus* is also similar, but typically has orange tones in the cap, and grows with oak and Tanoak; it has a wine-red to dark rosy purple KOH reaction on the cap, and a bright neon pink reaction in the flesh. *Cortinarius alboviolaceus* has a dry, silvery violet cap, lacks the bulbous stipe base and doesn't show a distinctive reaction to KOH.

Cortinarius sierraensis

(Ammirati) Ammirati, Niskanen & Liimat.

COMMON NAME:

SPECIES CODE:



FAMILY: Cortinariaceae

SYNONYMS: *Dermocybe sierraensis* Ammirati

SUMMARY: A small to medium-sized mushroom with an orange-brown to reddish orange cap, bright to deep red gills, and rusty orange spores. It grows with Lodgepole Pine in summer and fall. Rare; only known from four locations in higher elevation Lodgepole Pine forests in the Sierra Nevada, often near lakes, streams or other water bodies.

TAXONOMIC NOTES: First described by Ammirati (1989) as *Dermocybe sierraensis*; it was later transferred to *Cortinarius* (Niskanen et al. 2013).

DISTRIBUTION: Known from four sites in the southern and central Sierra Nevada in California. **USA: CA: Alpine Co.,** ENF, Blue Lake. **Mariposa Co.,** YNP, Hwy 120 between Porcupine Flat and Crane's Flat. YNP, off Highway 120, Tioga Pass. **Mono Co.,** Humboldt-Toiyabe National Forest, Trumbull Lake.

DESCRIPTION: CAP 2–4 cm across, convex to plane, at times with a low, broad umbo. Surface appressed silky fibrillose to smooth. Bright brownish orange to red-orange, fading with age, becoming shiny when dry. GILLS broadly attached,

at times with a shallow notch, narrow, close to crowded. Bright, dark red to deep rusty red. **STIPE** 2–4 (5) cm long, 0.2–0.4 cm wide, equal or enlarged towards base. Surface dry, silky fibrillose to smooth, with silky veil remnants on mid/upper portion when young, base with vinaceous to yellowish orange mycelium. Orange-red to vinaceous red, darkening slightly when handled. **FLESH** thin, fibrous, pinkish to vinaceous red. Stipe solid when young, pinkish to orange-red. **ODOR** indistinct. **TASTE** indistinct. **SPORE DEPOSIT** rusty orange. **MICROSCOPY:** Spores 7.5–9 (9.5) x 5–5.5 μm , ellipsoid, coarsely roughened, light yellow-brown. **Basidia** 24–36 x 6.5–9 μm , 4-spored, clavate, with pinkish pigment. **Pleurocystidia** and **cheilocystidia** absent. **Pileipellis** a cutis with some ascending terminal elements. Top 2–4 layers of hyphae 5–15 μm wide, not or finely encrusted. Lower hyphae 5–20 μm wide, often aniline-red with aniline-red granules, not encrusted. **Clamp connections** present.

ECOLOGY: Ectomycorrhizal. Scattered, growing from duff and soil under Lodgepole Pine (*Pinus contorta* ssp. *murrayana*). Fruiting in summer and early fall.

SIMILAR SPECIES: Most similar is *Cortinarius neosanguineus*, which has a deep blood-red to dark garnet-colored cap, gills and stipe; it grows with Western Hemlock (*Tsuga heterophylla*) on the northern coast of California and farther north into the Pacific Northwest. *Cortinarius smithii* has a blood-red to brown cap, deep blood red gills, and a yellowish stipe; more common on the coast, it also occurs in the Sierra Nevada foothills, typically under pine. Its larger size, deeper red gills (lacking orange tones unless the spores are mature) and yellowish stipe help separate it. *Tubaria punicea* somewhat resembles *Cortinarius sierraensis*, but grows on rotten Pacific Madrone (*Arbutus menziesii*) trees and stumps and has paler, smooth spores.

Photo: © Fred Stevens.

Cortinarius truckeensis

Bojantchev

COMMON NAME:

SPECIES CODE:



FAMILY: Cortinariaceae

SYNONYMS: None

SUMMARY: A medium-sized to large, white-capped mushroom which fruits in spring and early summer in Jeffrey Pine (*Pinus jeffreyi*) forests of the east slope of the Sierra Nevada. No other species of spring-fruited *Cortinarius* has the combination of a white or pallid cap, thin, evanescent cortina, often clustered growth habit and amygdaliform to broadly fusiform spores. Although it can be abundant at the type locality, it's currently only known from two locations within 20 km of each other north of Truckee.

TAXONOMIC NOTES: Described by Bojantchev (2013), from north of Truckee in the Tahoe National Forest.

DISTRIBUTION: Known from two sites near Truckee, CA. Potentially more widespread in eastside pine forest. **USA: CA: Nevada Co.,** TNF, north of Truckee, off Highway 89 (Type). TNF, Cold Creek Campground.

DESCRIPTION: CAP 4–10 cm across, convex to plane, occasionally depressed in center. Margin inrolled to down-curved well into maturity, often undulating.

Surface fibrillose to smooth, silky to shiny, faintly hygrophanous. White to light gray-white, remaining so or browning slightly in maturity. **GILLS** broadly to narrowly attached, often with a deep notch, moderately crowded to subdistant, broad. Tan to light brown, becoming rusty brown as spores mature. Edges even, paler. **STIPE** 3–9 cm long, 2–4.5 cm wide, equal, cylindrical. Surface smooth to silky, shiny, white. **CORTINA** scant, evanescent, white. **UNIVERSAL VEIL** white, occasionally leaving an evanescent annular zone at the base of the stipe. **FLESH** firm, solid, white to pale beige, at times mottled with tan to brown streaks. **ODOR** earthy. **TASTE** mild, earthy. **KOH** no reaction. **UV LIGHT** no change. **SPORE DEPOSIT** rusty brown. **MICROSCOPY: Spores** (8.5) 9–11 (12) × 5–6 μm, inequilaterally amygdaliform to broadly fusiform, very finely roughened. **Basidia** 32–44 × 7–10 μm, 4-spored (rarely some 2-spored), cylindro-clavate. **Pleurocystidia** and **cheilocystidia** absent. **Pileipellis** a cutis; upper layer of thin parallel hyphae 3–8 μm wide, with brown pigment in KOH. Lower layer composed of thin-walled hyphae 9–25 μm wide. **Clamp connections** present.

ECOLOGY: Ectomycorrhizal, presumably associated with Jeffrey Pine. Fruit bodies often in clusters (more rarely solitary) in soil or duff; often pushing up the duff layer, but rarely breaking the surface. Fruiting in late spring and early summer.

SIMILAR SPECIES: *Cortinarius magnivelatus* also has a white cap and fruits under the duff layer, but is often solitary, has a short, stout stipe, and has a thick, persistent partial veil. A number of other *Cortinarius* species (especially in subgenus *Telamonina*) occur in the California mountains. Most have darker caps, differently shaped spores, or fluoresce under UV light.

Photo: © *Dimitar Bojantchev.*

Cortinarius velatus

Thiers & A.H. Sm.

COMMON NAME:

SPECIES CODE:



FAMILY: Cortinariaceae

SYNONYMS: None

SUMMARY: A medium-sized mushroom with a typically hypogeous or erumpent habit, a short, stout stature, a lilac to lavender cap, a thick, persistent veil, and rusty spores. Very rare; known from three collections, two of which were made prior to 1975. It is known from the central and southern Sierra Nevada in high-elevation Lodgepole Pine and fir (*Abies* spp.) forests.

TAXONOMIC NOTES: Described by Thiers & Smith (1969) from Huntington Lake, in SieNF. This species is known from only three collections, so some variation from the original description is expected. A collection made in Sierra Co. (H. Saylor 4222, Halling 5298) labeled as *C. velatus* is misidentified.

DISTRIBUTION: Extremely rare, occurring in high-elevation Sierra Nevada forests. Currently known from two historic collections and one recent collection. Also reported (but not collected) from near Pinecrest. **USA: CA: Amador Co.,** ENF, Silver Lake. **Tuolumne Co.,** StaNF, Pinecrest (unconfirmed, Thiers & Smith 1969). **Fresno Co.,** SieNF, Huntington Lake (Type). SieNF, near Weldon's Cow Camp

and Dinkey Lakes Wilderness boundary.

DESCRIPTION: **CAP** 3–5 cm across, convex to plane, soon shallowly depressed in center, and becoming wavy and irregular in age. Margin incurved, attached to stipe by a persistent veil. Surface tacky to dry, often with debris attached, smooth to pubescent. Lilac to lavender, occasionally more dingy purple; unchanging, browning or becoming paler towards margin in age. **GILLS** decurrent, thin, fragile; covered by persistent veil. Whitish to pallid when young, becoming bright rusty brown as spores mature. **STIPE** 1–3 cm long, 1–1.5 cm thick, equal, short, stout. Whitish to pale lilac or lavender. **CORTINA** thick, radially fibrous; persistent, becoming radially shredded in age. Lilac when young, fading slightly in age. **FLESH** thick, firm, fleshy. White, unchanging or developing brownish tones in age. **ODOR** very pungent. **TASTE** indistinct. **KOH** yellow-orange to orange on cap, golden yellow to yellowish on flesh. **SPORE DEPOSIT** rusty brown. **MICROSCOPY:** **Spores** 9.5–12.8 x 5.5–6.5 μm , ellipsoid to subovoid, very finely punctate. **Basidia** 18–24 x 5–6 μm , 4-spored, clavate, hyaline. **Pleurocystidia** and **cheilocystidia** absent. **Clamp connections** present.

ECOLOGY: Scattered or in small clusters, typically buried in duff, rarely breaking through the soil surface. Ectomycorrhizal with conifers, but exact host associations unknown. The most recent collection was in Lodgepole Pine (*Pinus contorta* ssp. *murrayana*) and Red Fir (*Abies magnifica*) forest. Fruiting in summer and fall.

SIMILAR SPECIES: *Cortinarius magnivelatus* has a white cap that can discolor yellowish in age, and a thick white veil. *Cortinarius verrucisporus* has a buff to yellow cap, a thick, yellow partial veil of radial fibrils that remains mostly unbroken, and distinctly roughened spores.

Photo: © Thea Chesney.

Cortinarius verrucisporus

Thiers & Smith

COMMON NAME:

SPECIES CODE: COVE12



FAMILY: Cortinariaceae

SYNONYMS: None

SUMMARY: A medium-sized mushroom with a typically hypogeous or erumpent habit, a short, stout stature, and a persistent membranous veil. Recognized by its buff to greenish yellow cap, a thick, yellow partial veil of radial fibrils that remains mostly unbroken, and lots of rusty brown spores.

TAXONOMIC NOTES: Described by Thiers & Smith (1969) from Silver Lake in ENF. There may be other cryptic species in this group; modern taxonomic work is needed.

DISTRIBUTION: Uncommon in the Sierra Nevada, rare in the Cascades, occurring into southern Oregon. Also reported from Utah and Colorado; these collections should be examined and compared genetically to California collections of *C. verrucisporus* and *C. saxamontanus*. **USA: CA: Siskiyou Co.**, S-TNF, Mount Shasta, near ski lodge. S-TNF, near Little Glass Mountain. S-TNF, one mile southeast of Red Tank Spring. **Modoc Co.**, MoNF, Warner Mtns, Soup Spring. **Shasta Co.**, LVNP, Summit Lake. **Plumas Co.**, LNF, Lake Almanor. **Sierra Co.**, TNF, Yuba Pass. TNF, 5.3 miles up Weber Lake Road off Yuba Pass. TNF, Chapman Creek

Campground. TNF, Haskell Peak Road near junction w/Gold Lake Rd. TNF, Highway 49, 3 miles east of Yuba Pass. TNF, Highway 49, Webber Lake Road. TNF, Highway 89, 4.7 miles north of Highway 49. TNF, Lincoln Creek Campground. TNF, Snow Park. TNF. San Francisco State University Sierra Nevada Field Campus. **El Dorado Co.**, ENF, Silver Fork Rd. **Amador Co.**, ENF, Silver Lake (Type). **Alpine Co.**, StaNF, Lake Alpine. **Tuolumne Co.**, YNP, along Glacier Point Rd. **Fresno Co.**, SieNF, Huntington Lake. **OR**: 4 sites. **UT**: 1 site. **CO**: 1 site.

DESCRIPTION: CAP 3–7 cm across, convex when young, becoming plane, or shallowly depressed in center, margin incurved when young, becoming wavy and irregular in age; attached to stipe by a membranous-fibrillose persistent partial veil. Surface dry to slightly tacky, appressed-fibrillose to smooth, often with whitish veil remnants. Whitish to light buff when young, soon yellow to tawny, with brighter yellow or rusty brown stains, to dingy yellow with reddish brown over disc in age. **GILLS** typically obscured by the persistent, silky-membranous veil, mostly visible in age and/or where veil is torn. Broadly attached to subdecurrent, often notched at stipe, close to subdistant, somewhat ragged, and occasionally interveined. Pallid, grayish buff to olive-buff at first, becoming rusty brown as spores mature. **STIPE** 1–3 (5) cm long, 1–2 cm thick at apex, equal or bulbous at base. Often short and stout, sometimes poorly formed. Whitish to pale yellowish, soon rusty-stained with spores. **CORTINA** tough, radially fibrillose, very persistent, but usually with a few radial tears in age. Yellow, soon covered with rusty brown spores. **FLESH** thick, firm, fleshy. Whitish to creamy buff. **ODOR** indistinct. **TASTE** indistinct. **KOH** vinaceous on cap. **SPORE DEPOSIT** rusty brown. **MICROSCOPY:** **Spores** 10.5–13 x 6.5–8 μm ovoid, thick-walled, distinctly roughened with coarse warts. **Basidia** 27–30 x 7–9 μm , 4-spored, clavate, hyaline. **Pleurocystidia** and **cheilocystidia** absent. **Clamp connections** present.

ECOLOGY: Hypogeous, solitary or scattered, rarely in small clusters under duff or in soil. Rarely becoming exposed, but more often breaking the surface in areas with hard-packed ground and/or a thin duff layer. Ectomycorrhizal with conifers, likely primarily with *Abies*. Fruiting in late spring and summer; rarely occurring in fall.

SIMILAR SPECIES: *Cortinarius magnivelatus* and *C. velatus* share a similar stature and hypogeous or erumpent fruiting habit. *C. magnivelatus* differs by having a white cap, and a thick white veil. *C. velatus* has a purplish to lilac cap and lilac to lavender persistent veil. A few other *Cortinarius* species can resemble these persistent-veiled species, but have stipes that soon elongate, and have much sparser, silky cortina-type partial veils at maturity.

Dendrocollybia pycnoramella

N. Siegel & C.F. Schwarz nom. prov.

COMMON NAME: Short-branched Dendro

SPECIES CODE:



FAMILY: Unknown.

SYNONYMS: None

SUMMARY: A tiny mushroom with an opaque gray cap, a stipe densely covered with short side branches, arising from an irregular, lobed scerotium. Extremely rare; currently known from two sites, in low- to mid-elevations. One in Santa Cruz, California, the other near Murphy, Oregon. Both came from mixed hardwood-conifer forest. More likely to occur in the Coast or Klamath Range in California, and it could potentially occur in the Sierra Nevada foothills.

TAXONOMIC NOTES: An undescribed species profiled in *Mushrooms of the Redwood Coast* (Siegel & Schwarz, 2016); soon to be officially published. Nomenclatural issues related to asexual/sexual (anamorphic/teleomorphic forms) may result in placing this species in *Tilachlidiopsis*.

DISTRIBUTION: Extremely rare; currently known from two sites. **USA: CA:** Santa Cruz Co., University of California at Santa Cruz upper campus. **OR:** Josephine Co., near Murphy, Bureau of Land Management, Spencer Creek Road.

DESCRIPTION: CAP 0.2–0.6 (0.8) cm across, bell shaped to convex, with a low, round

umbo; margin uneven to weakly ribbed. Surface smooth, moist to dry. Opaque, beige-tan to grayish tan, usually darkest at center of cap, sometimes appearing weakly zonate. **GILLS** narrowly attached, close to subdistant, narrow. Pale gray when young, becoming buff-gray to dingy tan. **STIPE** 0.7–2 cm long, 0.1–0.2 cm thick, equal, base of stipe directly emerging from a sclerotium. Surface densely and evenly covered in small branches with slightly enlarged, rounded tips. Pale gray to grayish tan. **SCLEROTIUM** 0.3–1 cm wide, irregularly ellipsoid and often lobed, with a bumpy-warted surface. Black, hard. **FLESH** very thin, grayish to tan. **ODOR** indistinct. **TASTE** indistinct. **KOH** no reaction. **SPORE DEPOSIT** whitish to pale buff, scant. **MICROSCOPY: Spores** 4–5 x 2–2.5 μm , ellipsoid, smooth. Asexual spores from stipe 5–10 x 2.5–3 μm , highly irregular, cylindrical, peanut shaped, or bent. **Basidia** 4-spored. **Pleurocystidia** and **cheilocystidia** absent. Surface of sclerotium composed of brown, mazelike or branched thick-walled hyphae. **Clamp connections** present.

ECOLOGY: Fruiting in small clusters from sclerotia embedded in (often-obscure) buried remains of rotting mushrooms. The sclerotia likely form on decaying mushrooms in fall to early spring, and then produce fruit bodies the following fall. The identity of the host mushrooms is not known with certainty, but based on habitat, and other associated species where found, the host mushrooms may have been *Armillaria mellea* or *Hypholoma fasciculare*. The Santa Cruz collection was made in mixed hardwood-conifer forest with Coast Live Oak (*Quercus agrifolia*), Douglas-fir (*Pseudotsuga menziesii*), Coast Redwood (*Sequoia sempervirens*), and Tanoak (*Notholithocarpus densiflorus*). The Murphy site was dominated by Douglas-fir.

SIMILAR SPECIES: *Dendrocollybia racemosa* has longer, more widely spaced side branches on the stipe, and has round to ovoid, smooth sclerotia. *Collybia cirrhata*, *C. tuberosa* and *C. cookei* all grow on decaying mushrooms (occasionally intermixed with *Dendrocollybia*), but have white to creamy buff caps and lack the side branches on the stipe. Fruit bodies of *Collybia tuberosa* emerge from reddish brown sclerotia that resemble apple seeds; *Collybia cookei* has fruit bodies that emerge from a yellowish sclerotium resembling a shriveled corn kernel, and *Collybia cirrhata* lack sclerotia at their stipe bases entirely, instead emerging directly from their decaying mushroom substrate (often a *Lactarius* species). Because of their bright white cap color, the latter three species are easier to detect than *Dendrocollybia racemosa*, and can be used as indicators for appropriate micro-habitats where *Dendrocollybia* is often found. *Mycena* species have conical to bell-shaped, translucent-striate caps, and thin, fragile stipes that lack any side branches.

Dendrocollybia racemosa

(Pers.) R.H. Petersen & Redhead

COMMON NAME: Long-branched Dendro

SPECIES CODE: DERA5



FAMILY: Unknown

SYNONYMS: *Agaricus racemosus* Pers., *Collybia racemosa* (Pers.) Quél., *Microcollybia racemosa* (Pers.) Lennox, *Mycena racemosa* (Pers.) Gray, *Sclerotilbum septentrionale* Povah, *Sclerotium fungorum* var. *lacunosum* (Pers.) Fr., *Sclerotium lacunosum* Pers., *Tilachliidiopsis racemosa* Keissl.

SUMMARY: An easily recognized small mushroom with an opaque gray cap and a stipe with numerous side branches. The base of the stipe emerges from a tiny, round, black sclerotium. Common on the California coast, but because of the small size and drab colors of the fruit bodies and the tendency to be partially buried in duff, they are easily overlooked. Occasionally in the Sierra Nevada, mostly occurring in mixed hardwood/conifer forest below 1200 m. Known from at least 45 locations in California. This species is listed as “Forest Service Sensitive” on some of California’s National Forest. The California Rare Fungi Working Group believes this fungus is common and should be delisted.

TAXONOMIC NOTES: Long called *Collybia racemosa*, the genus *Dendrocollybia* was erected to accommodate this species in 2001 (Hughes et.al.). The European species under this name has not been genetically compared to its western North Ameri-

can counterpart. There are subtle morphological differences. Nomenclatural issues related to asexual/sexual (anamorphic/teleomorphic forms) may result in prioritization of the anamorph name, *Tilachlidiopsis* (Keissler 1924).

DISTRIBUTION: Common on the California coast, especially north of San Francisco. Fairly common in low- to mid-elevations in the Klamath Range, occasional in the Sierra Nevada and Cascade foothills, rare at higher elevations of the Sierra Nevada and Cascade Range in California. Common from the coast east to the Cascades in Oregon and Washington, occurring north into southcentral Alaska. Also known from the Rocky Mountains in Colorado and Idaho, as well as Michigan, New Hampshire, Ontario, Canada, and Europe. **USA: CA: Del Norte Co.,** SRNF, Patrick's Creek Campground. **Siskiyou Co.,** KNF, 3 sites. **Trinity Co.,** S-TNF, 6 sites. **Shasta Co.,** S-TNF, 2 sites. **Yuba Co.,** TNF, Bullard's Bar Rec. Area, Hornswoggle Campground. TNF, Bullard's Bar Rec. Area, Rebel Ridge trailhead. TNF, Bullard's Bar Rec. Area, Schoolhouse Campground. **Sierra Co.,** TNF, San Francisco State University Sierra Nevada Field Campus, near Yuba Pass. **Nevada Co.,** TNF, Skillman Campground. **Placer Co.,** LTBMU, about 3 miles south of Tahoe City. **El Dorado Co.,** ENF, southeast of junction of Mosquito Road and Sand Mountain Road. Sly Park Campground. **Tuolumne Co.,** Tuolumne City (photo only). Coastal counties, Del Norte to Monterey: 25+ sites. **OR:** 15+ sites. **WA:** 22 sites. **AK:** 5 sites.

DESCRIPTION: **CAP** 0.5–1.5 cm across, bell shaped to convex, often with a low umbo, broadly convex to nearly plane in age. Opaque, light gray to grayish beige, sometimes dark gray or tan to brownish. Surface moist to dry, smooth. **GILLS** narrowly attached, close to subdistant, narrow. Pale gray to dingy yellowish tan. **STIPE** 1–6.5 (9) cm long, 0.1–0.2 cm thick, equal to ground, with a narrowed, lower portion often twisting through duff. Surface irregularly covered in straight to curved conidial branches, 0.3–0.5 cm long with enlarged, rounded tips. These branches are sometimes very sparse, or can be lost in age, and in such cases, the stipe can appear mostly smooth. Base of stipe emerging directly from small, black sclerotium. **SCLEROTIUM** 0.2–0.7 cm wide, rounded, oval or egg-shaped, surface smooth, matte black, hard. **FLESH** very thin, grayish to tan. **ODOR** indistinct. **TASTE** indistinct. **KOH** no reaction. **SPORE DEPOSIT** whitish, scant. **MICROSCOPY: Spores** 4–5 x 2–3 μm , narrowly ellipsoid, smooth. Asexual spores from stipe 7–12 x 3–5 μm , highly irregular, cylindrical, peanut shaped, or bent. **Basidia** 16–22 x 3.5–4.5 μm , narrowly clavate, 4-spored. **Pleurocystidia** and **cheilocystidia** absent. **Cap cuticle** non-gelatinous, with radially arranged hyphae 2–4 μm across, weakly incrustated with gray pigments. **Clamp connections** present.

ECOLOGY: Typically clustered (rarely solitary), on the often-indistinguishable remains of rotting mushrooms, particularly those of *Lactarius* and *Russula* species. The sclerotia form on decaying mushrooms in fall to early spring and become buried in duff; fruiting occurs the following fall. Occasionally fruiting consecutive years in the same location (likely from sclerotia that didn't produce fruit bodies the previous year). Suitable habitat is highly diverse, since a range of suitable host *Russula* and *Lactarius* species occur in many habitats. Dense, thick-fleshed species such as those in the *Russula brevipes* group, and the blackening russulas (especially *R. albonigra* and *R. nigricans*), as well as *Russula crassotunicata* and *Lactarius alnicola* appear to be preferred hosts.

SIMILAR SPECIES: *Dendrocollybia pycnoramella* N. Siegel & C.F. Schwarz nom. prov. (an undescribed species) has shorter, more closely spaced conidial branches and smaller and shorter fruit bodies arising directly from an irregular, knobby-warted sclerotia—it may occur in the mountains of California and Oregon but is currently known from only two sites, both relatively low-elevation. Several *Pseudobaeospora* could be confused for *Dendrocollybia* without conidial branches, but they never have conidial branches (some species have stiff or pubescent hairs on the lower stipe unlike *Dendrocollybia*) and in many cases, distinctive KOH reactions. Microscopically, they have tiny, subglobose to broadly ellipsoid spores. See the Similar Species for *D. pycnoramella* for discussion of *Collybia* and *Mycena* species.

Galeropsis polytrichoides

(Zeller) Zeller

COMMON NAME:

SPECIES CODE:



FAMILY: Bolbitiaceae

SYNONYMS: *Secotium polytrichoides* Zeller

SUMMARY: A small to tiny mushroom with a thin stipe, brown, cylindrical to obtuse-conical cap that doesn't open, (as the name suggests, reminiscent of *Polytrichum* moss capsules), a wispy partial veil of whitish to buff fibrils, and which grows in wet meadows. Rarely reported; known from 10 sites in the Sierra Nevada, three sites on Mount Shasta, and a single collection from Mount Lassen. The diminutive stature and dull colors make this a difficult mushroom to spot, and thus, it may be under reported.

TAXONOMIC NOTES: Described by Zeller (1941) as *Secotium polytrichoides*, from Mount Shasta, in Siskiyou County, California. The genus *Galeropsis* was coined by Zeller (1943) to accommodate this species.

DISTRIBUTION: Rare; known from high-elevation meadows and seeps on Mount Shasta and Mount Lassen in the southern Cascades and scattered sites in the Sierra Nevada. **USA: CA: Siskiyou Co.,** S-TNF, Mount Shasta, Horse Camp (Type). S-TNF, Mount Shasta, Panther Creek Meadows. S-TNF, Mount Shasta, Squaw

Valley Creek. **Shasta Co.**, LVNP. **Sierra Co.**, TNF, Yuba Pass. TNF, Lincoln Creek Campground. **Amador Co.**, ENF, Highway 88, 3 miles east of Silver Lake Campground. ENF, Silver Lake Campground. **El Dorado Co.**, ENF, near Kyburz. **Calaveras Co.**, StaNF, Big Meadow Campground. **Mariposa Co.**, SieNF, near upper Chowchilla Mountain, 1.4 miles north of turnoff to Signal Peak Lookout. **Inyo Co.**, INF, Big Pine Lake (unconfirmed). **Fresno Co.**, SieNF, Huntington Lake. SeqNF, meadow across from Ten Mile Campground.

DESCRIPTION: CAP 0.5–1.5 cm tall, 0.3–0.5 (0.7) cm across, cylindrical to obtuse-conic, acutely to bluntly pointed, margin typically pinched to stipe, not expanding in age. Surface lubricous to dry, margin with pallid fibrils adhering to stipe; faintly striate when moist. Brown to dark golden brown when young, becoming two-toned; fading from center outwards in age. **GILLS** attached, notched, close to crowded, slightly anastomosed near margin. Cinnamon-brown to rusty brown. **STIPE** 2–6 cm long, 0.5–1 mm thick, wiry, thin. Whitish to pale tan or pale vinaceous at apex, transitioning to a dark brown to mahogany-brown base. Surface with twisted striate fibrils, appressed-fibrillose to nearly smooth, often with silky veil remnants. **PARTIAL VEIL** consisting of long, whitish to buff fibrils adhering to cap margin or forming a fibrillose zone just below the unexpanded cap. **FLESH** thin, cinnamon-buff in color. **ODOR** indistinct. **TASTE** indistinct. **MICROSCOPY:** **Spores** 10–13 x 5–7 μm , ellipsoid to amygdaliform in face-view, slightly inequilateral in side-view, apex truncate with a germ pore, smooth, moderately thick-walled. **Basidia** 25–29 x 7–8 μm , short pedicellate, hyaline to yellow-brown in KOH, (2-) 4-spored. **Cheilocystidia** 20–42 x 12–18 μm , variable in shape, often tapering at apex. **Pleurocystidia** not found. **Clamp connections** present.

ECOLOGY: Saprobic; with solitary or scattered fruiting bodies in bogs, moist meadows, seeps, and along streambanks; often in moss or grass. Fruiting in spring and summer, often from snowmelt moisture.

SIMILAR SPECIES: *Leratiomyces cucullatus* is very similar but lacks the fibrillose veil on the stipe and cap margin, is typically paler in color, and has a scruffy stipe. Numerous *Galerina* species can also look similar, but have cap margins that expand, and exposed gills at maturity.

Gomphidius pseudoflavipes

O.K. Mill. & F.J. Camacho

COMMON NAME: Big-spored Slime Spike

SPECIES CODE:

FAMILY: Gomphidiaceae

SYNONYMS: None

SUMMARY: An extremely rare “slime spike”, known only from the type location, in mixed pine-true fir woods in Sierra National Forest. Recognized by its orange-brown cap with radially arranged dark brown fibrils, slightly decurrent, well-spaced gills, bright yellow flesh in the stipe base and giant spores, up to 40 μm long. It fruits in association with (possibly parasitic on) “*Gastrosuillus*” (which in turn is ectomycorrhizal, likely with *Pinus*) in high-elevation forests of the southern Sierra Nevada.

TAXONOMIC NOTES: Described by Miller et al. (2002) from a single collection comprised of four fruit bodies made in 1999. Very little is known about the morphological variation or habitat associations of this species. Additional collections need examination to evaluate morphological variation.

DISTRIBUTION: Only known from the type collection in the southern Sierra Nevada.

USA: CA: Fresno Co., SieNF, Dinkey Creek area.

DESCRIPTION: **CAP** 2–4 cm across, convex. Surface dry, with radially arranged dark brown fibrils over an orange brown base color. **GILLS** subdecurrent, moderately to well-spaced. Gray-brown (likely paler when young). **STIPE** 5–8 cm long, 1–2 cm thick, equal or tapering towards base. Surface dry, with scattered brown fibrils, over a dull yellowish base color. **PARTIAL VEIL** densely fibrous when young, leaving scattered fibrils in a superior, thin annular zone. **FLESH** firm, white in cap and upper stipe, in stipe base bright yellow. **ODOR** unknown. **TASTE** unknown. **MICROSCOPY:** **Spores** 18–33 (40) x 6–8 (9.5) μm , broadly fusiform, subfusiform to nearly cylindric, smooth, moderately thick-walled, yellow-brown in KOH, weakly dextrinoid in Melzer’s reagent. **Basidia** 50–68 x 9.5–12.5 μm , clavate, thin walled, hyaline, 4-spored. **Pleurocystidia** and **cheilocystidia** 116–123 x 13–19 μm , narrowly clavate to subfusiform, thin-walled, hyaline or with yellow-brown contents and some brown incrustations in KOH and Melzer’s reagent. **Pileipellis** consisting of erect to decumbent hyphae (3) 4–10 μm across. **Pileitrama** made up of interwoven, filamentous, thin-walled hyphae 4.5–11 (17) μm across.

ECOLOGY: Solitary or scattered in duff and soil under pine (*Pinus* spp.) and fir

(*Abies* spp.). *Gomphidius* species in general are associated with *Suillus* and *Rhizopogon*, likely as myco-parasites of those taxa. *Gomphidius pseudoflavipes* was found close to an unspecified "*Gastrosuillus*" species. The single collection known was made during summer (early August), but it seems likely that this species could fruit from spring into fall.

SIMILAR SPECIES: *Gomphidius subroseus* has a dark rosy pink, reddish pink, or pastel pink cap, fading slightly in age, a yellow stipe base and it grows under Douglas-fir (*Pseudotsuga menziesii*), likely associated with *Suillus lakei*. *Gomphidius smithii* has a pinkish, pinkish buff to pinkish lilac cap which fades with age, and lacks a yellow stipe base; it also grows with Douglas-fir, likely also associated with *Suillus lakei*. *Gomphidius oregonensis* is typically larger, has a variable-colored cap ranging from dingy beige-white pinkish beige, reddish tan to ochre-brown, typically developing sooty olive or blackish blotches and streaks as it ages, a yellow stipe base, and grows with Douglas-fir as well, likely associated with *Suillus caeruleus*.

Hohenbuehelia mastrucata

(Fr.) Singer

COMMON NAME:

SPECIES CODE:



FAMILY: Pleurotaceae

SYNONYMS: *Agaricus mastrucatus* Fr., *Calathinus mastrucatus* (Fr.) Quél., *Hohenbuehelia atrocoerulea* var. *mastrucata* (Fr.) Krieglst., *Pleurotus mastrucatus* (Fr.) Sacc.

SUMMARY: Recognized by its pleurotooid shape, grayish cap covered with soft white tufts, a distinct gelatinous layer under the cap cuticle, white spores, and growth on decaying hardwoods. Rare in western North America; known from four California collections, and a single location from Oregon.

TAXONOMIC NOTES: First described by Fries (1818) based on a European type, subsequently transferred into *Hohenbuehelia* by Singer in 1949. No genetic studies have been done comparing western and eastern North American collections with their European counterparts.

DISTRIBUTION: Widespread; Occurring in Europe and North America, also reported from Japan. Rare across its range, especially so in western North America. Known from four California collections, and an individual location in Oregon. Locations range from 300 to 900 m. in Sierra Nevada foothills; potentially it could occur higher, within the range of Black Oak. **USA: CA: Stanislaus Co., La Grange**

Regional Park. **San Mateo Co.**, Purisima Creek Redwoods Open Space Preserve. **Placer Co.**, Penryn. **Calaveras Co.**, West Point. **OR:** 1 site.

DESCRIPTION: CAP 2.5–6 cm across, fan shaped, kidney shaped to nearly circular, margin inrolled into maturity, often becoming wavy and lobed in age. Surface covered with blunt spines or tufted scales and matted hairs at first (mostly lost in age), dry to wet, with a thin skin covering a gelatinous layer, up to 0.7 cm thick if wet, rubbery when dry. Gray, bluish gray to buff, frosted with whitish hairs and scales, especially toward center, becoming more watery buff when wet or grayish buff when dry in age. **GILLS** radiating out from attachment point, close to subdistant, narrow. White to beige to pale whitish buff in age. **STIPE** absent, fruit body laterally attached to wood, or occasionally with an indistinct stipe. **FLESH** thin, gelatinous when wet, rubbery when dry. Watery gray to watery buff on cap surface, whitish under that layer. **ODOR** indistinct. **TASTE** mild. **KOH** no reaction. **SPORE DEPOSIT** white. **MICROSCOPY:** **Spores** 7–9 x 4–5.5 μm , elliptical, smooth, inamyloid. **Basidia** 24–40 x 7–9 μm , clavate-cylindric, 4-spored, hyaline. **Cheilocystidia** 30–45 x 4 .5–7 μm , fusoid-ventricose to clavate-capitate, with necks 2–2.5 μm across, thick-walled, and encrusted with lanceolate crystals at the apex.

ECOLOGY: A saprotroph on decaying wood. Scattered on standing dead tree trunks or on sides of downed logs of a wide range of hardwoods. In California, it has been found on Tanoak (*Notholithocarpus densiflorus*), Black Oak (*Quercus kelloggii*), and willow (*Salix* sp.). The Oregon collection was on Black Cottonwood (*Populus trichocarpa*). Fruiting from early fall into spring.

SIMILAR SPECIES: *Hohenbuehelia grisea* is smaller, has a dark gray or, bluish gray to grayish brown cap which soon fades; the cap surface is distinctly velvety near the attachment point, but otherwise finely tomentose when young, becoming matted to nearly smooth in age (lacking large white tufts of *H. mastrucata*). Microscopically, it has ellipsoid to cylindrical spores measuring 6–9 x 3–4.5 μm . *Hohenbuehelia petaloides* is typically larger, has a smooth, gray to brownish cap, and often has a distinct off-center stipe. Although its flesh can be rubbery, it lacks the distinct layer of gelatin and tufts of whitish hairs seen in *H. mastrucata*. *Lentinellus montanus* has a light brown to pinkish buff cap that is felty near the point of attachment to the substrate), ragged or serrated gill edges, and ovoid to nearly round, amyloid-spined spores. It is a common spring fruiting species, occurring in the fir (*Abies* spp.) zone, growing on conifer branches near melting snowbanks.

Hygrophorus caeruleus

O.K. Mill.

COMMON NAME:

SPECIES CODE: HYCA21



FAMILY: Unknown

SYNONYMS: None

SUMMARY: A medium-sized mushroom, typically buried under duff, fruiting in spring and early summer. Recognized by the silvery blue, bluish gray to bluish green color, short, stocky stature and often strong, rancid-farinaceous odor. Currently reported from ~30 sites; including 15 sites in California (over half of these are photo records, not backed up with voucher specimens). The often cryptic growth (buried under duff) makes this species hard to find; but because of the blue colors and bad smell, it rarely goes unreported if found.

TAXONOMIC NOTES: Described by Miller (1984) from McCall, Idaho. Recent genetic analysis has shown close affinity with *Clitocybe* sensu lato, and it likely will get transferred to *Clitocybe* or a segregate genus in the near future.

DISTRIBUTION: Occurring in the Sierra Nevada, Cascade Range and northern Rocky Mountains; typically in drier forest habitat. (There are several California records on Mushroom Observer, and some reference vouchered collections, possibly in personal herbariums. Records with a photograph are listed here followed

by an asterisk.) **USA: CA: Siskiyou Co.**, S-TNF, near Harris Springs Campground. S-TNF, one mile southeast of Red Tank Spring. MoNF, Medicine Lake Highlands*. S-TNF, near McCloud*. **Modoc Co.**, MoNF, Warner Mountains, near Cedar Pass. **Shasta Co.**, LVNP*. **Plumas Co.**, LNF, Domingo Springs Campground*. **Sierra Co.**, TNF, Forest Service Road 52 south of Yuba Pass. TNF, Green Acres. TNF, Yuba Pass. **El Dorado Co.**, ENF, Crystal Basin, near Ice House Reservoir*. ENF, 2 miles southwest of Pi Pi Campground*. ENF, near Echo Summit*. **Tuolumne Co.**, StaNF, Evergreen Road*. YNP, Big Oak Flat Road, between west entrance and Merced Grove. **OR:** 8 sites. **WA:** 5 sites. **ID:** (**Valley Co.**, Payette National Forest, Bear Basin. McCall (Type).) An additional 11 collections are listed on MyCoPortal, with no location data. All were made by O. K. Miller and are likely from Idaho.

DESCRIPTION: CAP 2.5–9 cm across, rounded to convex with an inrolled margin when young, becoming broadly convex to plane, margin often wavy and uplifted in age. Surface moist to dry, occasionally felty to appressed-fibrillose, at times with small scales in age, typically cracked when dry. Silvery blue, grayish blue to creamy with bluish tint, or more rarely, sky blue when young, becoming bluish gray, and developing dingy stains, to gray in age; or occasionally brownish orange tones. **GILLS** broadly attached to slightly decurrent, close to well-spaced, broad, rather thick. Pale blue, bluish gray to bluish green when young, becoming blue-gray to grayish in age. **STIPE** 2–5 cm long, 1–3 cm thick, typically short and stout, irregular, tapering abruptly at base. Surface dry, finely pruinose at apex when young, with twisted, longitudinally appressed fibrils, base with white rhizomorphs. Colored much like the cap. **FLESH** moderately thick, firm, fibrous in stipe. Dingy white, with blue to bluish gray tones, brownish in stipe base, more grayish overall in age. **ODOR** farinaceous when young, becoming strongly rancid-farinaceous in age. **TASTE** mild when young, rather unpleasant, rancid in age. **SPORE DEPOSIT** white. **MICROSCOPY:** Spores 6.5–9 x 4–5 μm , ellipsoid, smooth, inamyloid. Basidia 35–45 x 7–8 μm , 4-spored, hyaline in KOH, yellowish in Melzer's reagent. **Cheilocystidia** and **pleurocystidia** absent. **Gill trama** interwoven. **Cap cuticle** an ixocutis of thin-walled, hyaline hyphae 2.5–5 μm wide. **Clamp connections** abundant.

ECOLOGY: Nutritional mode not known; closely related species (based on genetic data) are saprobic. Fruiting bodies are solitary, scattered, or in small clusters; typically buried under duff and litter. In California, it seems to prefer White Fir (*Abies concolor*) forest; but can be found in duff under most conifers. Unless it is growing in an area with hard packed soil, and limited duff, it is rarely exposed; but it will push up the duff, forming “shrumps”. Fruiting in spring, soon after

snowmelt, continuing into summer.

SIMILAR SPECIES: *Clitocybe odora* var. *pacifica* has a similar colored cap and gills, but is slenderer in stature, and has a sweet, pleasant, anise or fennel odor. It typically fruits in the fall. *Hygrophorus marzuolus* (sensu CA) has a grayish to blackish cap, and whitish to grayish gills; both of which can have a bluish tone; but never as pronounced as *H. caeruleus*. *Hygrophorus marzuolus* typically lacks an odor when young or can smell like swamp gas or a mouse nest in age. It grows on the edges of melting snowbanks in spring. *Clitocybe nuda* typically has more lilac to purplish colors to the young fruit body, (fading to gray or buff in age) crowded gills, often a bulbous stipe base, and a sweet odor.

Hygrophorus calophyllus

P. Karst.

COMMON NAME:

SPECIES CODE:



FAMILY: Hygrophoraceae

SYNONYMS: None

SUMMARY: Recognized by the dark grayish brown to dark brown viscid cap, broadly attached to slightly decurrent, thick-edged gills which are pale reddish when young, fading, but typically retaining some pinkish color in age, and a dry (to slightly viscid) stipe colored as cap. Most California records are historic (late 1930's), from areas that have since been logged or developed.

TAXONOMIC NOTES: *Hygrophorus calophyllus* is a species described from northern Europe, growing with pines (*Pinus* spp.) on calcareous soils. Work done on other *Hygrophorus* species has shown that the western North American species are distinct from their European counterparts. This might also apply to this species, in which case it will need to be named. Furthermore, California collections should be compared with Rocky Mountain collections.

DISTRIBUTION: Widespread across the western mountains, south into the southern Sierra Nevada, and the northern California coast. Slightly more common in the Rocky Mountains than in the Pacific States. Also known from scattered locations

in eastern North America, and Europe. **USA: CA: Del Norte Co.**, near the Oregon-California line, on Highway 199. Near Crescent City. **Humboldt Co.**, Big Lagoon. Trinidad. **Trinity Co.**, KNF (location unknown, specimen seen and photographed at Humboldt Bay Mycological Society show). **Plumas Co.**, LVNP, Upper Warner Valley Campground. **Yuba Co.**, TNF, Bullard's Bar Rec. Area. **Santa Cruz Co.**, Empire Grade (unconfirmed). **Fresno Co.**, SieNF, Huntington Lake. **OR:** 1 site. **WA:** 8 sites (a few collections are lacking precise location data). **ID:** 4 sites. **WY:** 1 site (unconfirmed). **CO:** ~10 sites. **NM:** 2 sites. **AZ:** 1 site. **CANADA: BC:** 4 sites

DESCRIPTION: **CAP** 2–5 cm across, rounded-convex to convex with an incurved margin when young, becoming broadly convex to nearly plane. Surface smooth, viscid when wet, tacky to lubricous, and often with debris stuck to it when dry. Dark grayish brown to dark brown, with orangish patches if covered with debris. **GILLS** broadly attached to slightly decurrent, subdistant, thick-edged, narrow to moderately broad. Reddish white to pale red when young, fading to whitish with a pink cast in age. **STIPE** 3–5 cm long, 8–1.2 (1.5) cm thick at apex, equal or tapered towards base. Surface dry (or viscid near base from cap slime when young), very finely pruinose. Whitish when young, soon colored like cap. **FLESH** thin to moderately thick, firm, fibrous in stipe; whitish throughout. **ODOR** indistinct. **TASTE** indistinct. **MICROSCOPY:** **Spores** 5.5–8 x 4–6 μm , ellipsoid to subellipsoid, smooth, inamyloid. **Basidia** 4.5–6.6 x 5–8 μm , 4-spored. **Cheilocystidia** and **pleurocystidia** absent. **Gill trama** divergent when young. **Cap cuticle** an ixotrichodermium (projecting gelatinized hyphae elements), hyphae irregular, terminal cells cylindrical to narrowly clavate; 2.5–5.0 x 2.5–3.5 μm . **Clamp connections** at the base of basidia, and in stipe cuticle.

ECOLOGY: Solitary or scattered in soil under conifers. Ectomycorrhizal with Pinaceae, with a single report from Chinquapin (*Chrysolepis chrysophylla*). Fruiting in fall or early winter.

SIMILAR SPECIES: *Hygrophorus atramentosus* (sensu California) is quite similar; it has a viscid, dark gray cap with a blackish disc, creamy white gills, and a gray, longitudinally streaked stipe; it is currently known only from a few locations on California's North Coast. *H. camarophyllus* has a squat, often robust stature, a dry, streaked grayish brown cap, widely spaced, decurrent, white gills, and dry, gray stipe. It's quite common in the Pacific Northwest Cascades; occasional in California. *H. marzuolus* (sensu western NA) is a common spring mushroom in the mountains, often fruiting on the edges of melting snow banks. It has a grayish to blackish cap, and whitish to grayish gills, occasionally with a bluish cast.

Photo: © Drew Parker.

Hygrophorus goetzii

Hesler & A.H. Sm.

COMMON NAME:

SPECIES CODE:



FAMILY: Hygrophoraceae

SYNONYMS: None

SUMMARY: One of our rarer snowbank-associated fungi; *Hygrophorus goetzii* can be easily recognized by the pink cap that fades as it ages, thick, widely spaced gills, and growth at or near the edges of melting snowbanks. Currently known from 13 sites in the Sierra Nevada, Cascade and Klamath ranges in California, ~25 sites in Oregon, and 2 in Washington.

TAXONOMIC NOTES: Described by Hesler & Smith (1963), from Mount Hood, Oregon. *Hygrophorus goetzei* is an orthographic variant.

DISTRIBUTION: Known from 13 confirmed sites in the Sierra Nevada and Cascade Range in California, continuing north into southern British Columbia, Canada. Restricted to high-elevation forest with Mountain Hemlock, in areas with heavy snowpack. **USA: CA: Siskiyou Co.**, KNF, near Lower Wright Lake. S-TNF, Mount Shasta, Red Butte. **Shasta Co.**, LVNP, near King Creek Meadow. LVNP, Summit Lake, LVNP, King Creek Picnic Area. LVNP, Mt. Harkness Trail. LVNP, Broke-off Mountain trail. LVNP, Terrace Lake Trail. LVNP, Crumbaugh Lake. **Sierra Co.**,

TNF Vic. Church Camp. TNF, about 5 miles south of Yuba Pass, on Forest Road 12. **Amador Co.**, ENF, near Silver Lake. **Tuolumne Co.**, YNP, near Cathedral Peak. YNP, on May Lake Rd, near Highway 120 (unconfirmed). **OR:** 25+ sites. **WA:** 2 sites. **CANADA: BC:** 2 sites.

DESCRIPTION: CAP 2–5 cm across, obtuse to convex at first, becoming broadly convex to plane, or slightly uplifted in age. Surface smooth, viscid when wet. Porcelain pink to rosy pink at first, fading to creamy pink or cream-colored in age. **GILLS** broadly attached to subdecurrent, moderately to widely spaced, thick and waxy. Pale pinkish to pinkish cream at first, becoming cream to pallid. **STIPE** 3–7 cm long, 0.3–0.8 cm thick, equal or enlarged slightly lower, occasionally rooting at base. Surface moist to dry, smooth, base with fine strigose hairs. Whitish to cream-colored, at times with pinkish streaks when young. **FLESH** thin, fibrous, whitish. **ODOR** indistinct. **TASTE** indistinct. **SPORE DEPOSIT** white. **MICROSCOPY:** **Spores** 12–15 x 7–9 μm , ellipsoid to ovoid, smooth, inamyloid. **Basidia** 50–71 x 10–13 μm , 4-spored. **Lamellar trama** parallel to slightly interwoven at the edge, divergent elsewhere. **Pleurocystidia** and **cheilocystidia** absent. **Pileipellis** a trichoderm of gelatinized hyphae, 169–500 μm thick; terminal cells cylindric, up to 30 x 2 μm . **Clamp connections** present.

ECOLOGY: Scattered around melting snowbanks; often growing up through the melted holes in the snow or at the immediate edge of banks. Ectomycorrhizal with Mountain Hemlock (*Tsuga mertensiana*), occurring in high-elevation forests. Fruiting in late spring or summer, depending on stage of snowmelt.

SIMILAR SPECIES: *Hygrophorus vernalis* is a snowbank-associated *Hygrophorus* with a viscid, yellowish tan to vinaceous fawn cap, decurrent whitish gills, and a whitish, moist to lubricous stipe. *Pseudoomphalina angelesiana* (= *Neohygrophorus angelesianus*) typically has smaller fruit bodies with darker brown to grayish brown caps, purplish to lilac-pink, decurrent gills and amyloid spores. Although it sometimes fruits near melting snowbanks, it is not restricted to this habitat. Another common snowbank species, *Clitocybe albirhiza*, can have pinkish buff to pale buff caps that fade in age, but differs by having crowded gills and thick white hairs and rhizomorphs on the stipe base.

Hygrophorus nemoreus var. *raphaneus*

Largent

COMMON NAME:

SPECIES CODE:



FAMILY: Hygrophoraceae

SYNONYMS: None

SUMMARY: The large size, apricot-orange to orange-brown viscid to dry cap, broadly attached to slightly decurrent whitish to orangish gills, a cucumber-like odor, and growth with oaks help distinguish *Hygrophorus nemoreus* var. *raphaneus*. Currently known from four locations.

TAXONOMIC NOTES: *Hygrophorus nemoreus* is a European species: The variety *raphaneus* was described by Largent (1985), from Cleveland National Forest, in Riverside County, California. It should be elevated to species rank.

DISTRIBUTION: Extremely rare; known from three voucher-confirmed locations, and a photo record from a fourth location. Two sites are within 2 miles of each other in the Santa Ana Mountains, and two records are from Santa Cruz County. A single specimen was brought into the Santa Cruz Fungus Fair in 2012, which likely came from Monterey County. Potentially, it could occur in the Coast Range, from Santa Cruz County, south into Mexico (no records currently exist south of Riverside County), and in the oak zone in the Sierra Nevada foothills. A collection

made in Douglas Co., Oregon, (Bureau of Land Management, North Bank Habitat Management Area) should be compared to California collections. **USA: CA: Santa Cruz Co.**, Quail Hollow Ranch County Park (photo only). Santa Cruz County (location unknown). **Riverside Co.**, Cleveland National Forest, El Cariso Campground (Type). Cleveland National Forest, Lion Spring.

DESCRIPTION: **CAP** 5–13 cm across, broadly convex with an inrolled margin at first, becoming nearly plane; margin often wavy, and slightly uplifted in age. Surface thinly viscid to dry, smooth to fibrillose-streaked, at times fibrils uplifting into small scales. Apricot-yellow to apricot-orange when young, slightly more orange-brown to orange-cinnamon in age. **GILLS** broadly attached to decurrent, close, narrow, some forking, with rather thick edges. Whitish to dull orange-yellow, or salmon. **STIPE** 4–10 cm long, 2–3.5 cm thick at apex, equal, tapered downwards, or slightly bulbous at base. Surface dry, scurfy to furfuraceous on upper portion; basal mycelium white, cottony. Whitish, pale salmon to apricot-orange. **FLESH** thick at the disc, fleshy in cap, fibrous in stipe. White or tinged apricot to orange. **ODOR** cucumber-like. **TASTE** mild to radish-like. **MICROSCOPY:** **Spores** 5–7 (10) x 2.5–4.6 μm , narrowly ellipsoid, smooth, inamyloid. **Basidia** 40–60 x 5–6 μm , 4-spored. **Cheilocystidia** and **pleurocystidia** absent. **Gill trama** divergent when young. **Cap cuticle** an ixocutis, terminal cells cylindrical; 25–100 x 1.2–2.5 μm . **Clamp connections** present in all parts.

ECOLOGY: Typically solitary, more rarely scattered in soil or duff under oaks. Ectomycorrhizal with oaks; (*Quercus agrifolia*, *Q. dumosa*). Fruiting in winter and spring.

SIMILAR SPECIES: *Cuphophyllus pratensis* is smaller, has deeper decurrent gills, more salmon orange to pinkish buff colors, and lacks an odor, or has a sweet odor. Microscopically, it has interwoven gill trama and wider spores (5–8 x 4–5.5 μm).

Hygrophorus vernalis

A.H. Sm.

COMMON NAME:

SPECIES CODE: HYVE9



FAMILY: Hygrophoraceae

SYNONYMS: None

SUMMARY: This “snowbank” mushroom can be identified by its viscid, grayish yellow to yellowish tan cap, which develops vinaceous tones in age, white, decurrent gills, a whitish stipe which is viscid on the lower portions, and growth in the spring and summer on the edges of melting snowbanks. Currently known from two collections from Mount Shasta in California, eight sites total.

TAXONOMIC NOTES: Described by Smith (1941) from Deer Lake, Olympic National Park, Washington. The single California collection came from Mount Shasta and has wider spaced gills than the type (per A.H. Smith). It is possible it represents a faded/pigmentless collection of *Hygrophorus goetzii*.

DISTRIBUTION: Described from the Olympic Peninsula in Washington; known from eight sites total. Known from two collections from a single site in California. **USA:** **CA:** Siskiyou Co., S-TNF, Mount Shasta, Panther Creek Meadows. **WA:** Clallam Co., Olympic National Park, near Deer Lake (Type). Olympic National Park, Hell Creek. Olympic National Park, near Elwha campground. **Lewis Co.,** Mount Rainier

National Park, Grove of the Patriarchs. **Pend Oreille Co.**, Colville National Forest, Sullivan Creek (photo only). **ID: Shoshone Co.**, Glidden Pass. **CANADA: BC:** West Vancouver, Cypress Bowl.

DESCRIPTION: CAP 3–5cm across, obtusely conical with an incurved margin at first, becoming convex with a broad umbo in age. Surface viscid to tacky, with a downy-pubescent margin when young, otherwise smooth. Pale grayish yellow, pale grayish brown to yellowish tan, typically paler, whitish towards margin when young; developing pale vinaceous colors as it ages. **GILLS** broadly attached to deeply decurrent, close to subdistant, narrow. Whitish to pale whitish buff. **STIPE** 4–6 cm long, 0.6–1 cm thick, equal or enlarged towards base. Surface viscid to slimy on lower portion, the slime often leaving dingy yellowish patches; finely appressed cottony fibrillose at apex, to smooth. White, discoloring yellowish on lower portion from slime in age. **FLESH** moderately thick, whitish to buff in cap. Stipe solid when young, stuffed with white pith, becoming hollow in age. **ODOR** indistinct. **TASTE** indistinct. **SPORE DEPOSIT** white. **MICROSCOPY: Spores** 11–15 x 5.5–7 μm , ellipsoid to oblong-ellipsoid, smooth, inamyloid. Basidia 50–70 x 7–11 μm , 2- and 4-spored. **Cheilocystidia** and **pleurocystidia** absent. **Gill trama** divergent. **Cap cuticle** an ixocutis with loosely interwoven, radially disposed hyphae, 2–3 μm wide. **Clamp connections** common on gill trama hyphae, rare or absent elsewhere.

ECOLOGY: Scattered on melting snowbanks; often growing up through the snow, or on the immediate edge of banks. Ectomycorrhizal, occurring in high-elevation forest with Pinaceae, maybe hemlock (attempts should be made to identify the mycorrhizal associate/s). Fruiting in late spring or early summer when winter snowpacks melt.

SIMILAR SPECIES: Another snowbank *Hygrophorus*, *H. goetzii* can be easily recognized when young by the porcelain pink cap. Faded specimens can usually be distinguished from *H. vernalis* by their widely spaced gills, creamy cap color, or by the wider spores (12–15 x 7–9 μm). Another common snowbank species, *Clitocybe albirhiza*, can have pinkish buff to pale buff caps, which fade in age; it differs by the crowded gills and thick, white hairs and rhizomorphs on the stipe base.

Photo: © Sava Krstic.

Leptonia cyanea var. *occidentalis*

Largent

COMMON NAME:

SPECIES CODE:



FAMILY: Entolomataceae

SYNONYMS: None

SUMMARY: A small to medium-sized mushroom with bluish gray to bluish brown squamules on a violet-brown background, whitish to pinkish gills and a tall, slender, violet to purple-blue stipe with darker, upright scales.

TAXONOMIC NOTES: Some authorities subsume *Leptonia* under *Entoloma*. *Leptonia cyanea* var. *occidentalis* is macro-morphologically quite similar to *L. tjallingiorum*, described from the Netherlands. Modern taxonomic work is needed for this group; until such time, we include collections identified as

either species in this document, and regard reports in our area as representing the taxon described from western North American: *L. cyanea* var. *occidentalis*.

DISTRIBUTION: Known from 20 sites, 8 of which are in California. Scattered from the North Coast of California, south into the northern Sierra Nevada, and north to British Columbia. Also known from the Rocky Mountains in Idaho and Colorado. All collections identified as *Leptonia cyanea* var. *occidentalis* unless otherwise noted. **USA:** **CA:** Del Norte Co., Jedediah Smith Redwood State Park (as *L. tjallingiorum*). **Humboldt Co.**, Bald Mountain. North Fork of Mad River. **Trinity Co.**, S-TNF, FR 16 between Big Bar & Hayfork (as *L. tjallingiorum*). **Shasta Co.**, S-TNF, Butcherknife Creek (as *L. tjallingiorum*). **Mendocino Co.**, MeNF, Pothole Creek Tributary. MeNF, Steel Pan. **Sierra Co.**, TNF, Yuba Pass. **Nevada Co.**, near Nevada City. **OR:** 1 site. **WA:** 4 sites. **ID:** 2 sites. **CO:** 2 sites. **CANADA:** **BC:** 1 site.

DESCRIPTION: CAP 1.5–8.5 cm across, convex at first, becoming broadly convex to plane, occasionally obscurely to broadly umbonate; margin becoming upturned in age. Surface densely appressed-squamulose on the disc, at times with erect

scales, becoming densely appressed-fibrillose towards the margin. Squamules and fibrils dark bluish gray or blackish blue on a violet white to pale violet background, becoming grayish buff to brownish orange in age. **GILLS** attached, often with a notch, close to subdistant moderately broad. White to creamy at first, becoming pinkish as spores mature; margin concolorous. Often staining gray-brown when bruised. **STIPE** 2.5–8.5 cm long, 0.2–1 cm thick at the apex, equal or enlarged towards base, at times bulbous. Surface scurfy to densely squamulose to nearly tomentulose at the apex, becoming appressed fibrillose, with recurved to appressed squamules. Fibers and scales dark violet to blackish blue, over a pale violet base color, which becomes brownish buff in age. **FLESH** thin, fragile, white with violaceous tones in cap. Stipe stuffed when young, hollow in age. **ODOR** faint to distinctly fragrant. **TASTE** mild to sweet. **MICROSCOPY: Spores** 7.8–11.0 x 5.3–7.8 μm , elongate-angular to irregularly and indistinctly angular, 6–8-sided, with a suprahilar depression. **Basidia** 28–44 x 9–12 μm ; clavate, 2- or 4-spored. **Cheilocystidia** and **pleurocystidia** absent. **Pileipellis** an irregularly entangled layer of hyphae with the terminal 5–6-cells inflated, up to 25 μm across. **Pileocystidia** 28–69 x (9) 16–22 μm , broadly elliptical, clavate, broadly cylindro-clavate to cylindrical. **Tramal hyphae** of pileus 90–260 x 6–20 μm . **Clamp connections** present.

ECOLOGY: Saprobic; typically on large-diameter, fairly well-decayed conifer logs and stumps, with solitary or scattered fruiting bodies. Few habitat notes are available, but recent California collections have been from mid-elevation, old-growth forests in the Cascades. Fruiting in fall and early winter.

SIMILAR SPECIES: Other lignicolous species of *Leptonia* in California include *L. subeuchroa*, *L. cyaneonita*, and *L. violaceonigra*. *Leptonia cyaneonita* has a dark bluish black cap and stipe, white gills and an indistinct odor; microscopically the pileipellis is a layer of entangled hyphae, with scattered clamp connections; its spores average between 9–10 μm long. *Leptonia subeuchroa* is very similar to *L. cyaneonita* in color, but has a pileipellis composed of distinct chains of cells, lacks clamp connections, and has spores under 9 μm long. *Leptonia violaceonigra* has a dark bluish black cap, and bluish gills; microscopically, its pileipellis is a layer of entangled hyphae, with abundant clamps, and it has spores averaging over 10 μm long. All these species are rare and should be collected if encountered.

Leratiomyces cucullatus

(Shope & Seaver) Beever & D.C. Park

COMMON NAME:

SPECIES CODE:



FAMILY: Strophariaceae

SYNONYMS: *Weraroa cucullata* (Seaver & Shope) Thiers & Watling, *Galeropsis cucullata* (Shope & Seaver) Singer, *Bolbitius cucullatus* Shope & Seaver, *Cyttaro-phyllum cucullatum* (Shope & Seaver) A.H. Sm. ex Singer.

SUMMARY: A small, slender, inconspicuous mushroom with an ochre-buff, cylindrical to narrowly conical cap that doesn't open to reveal fertile tissue, having an ephemeral partial veil, and growing in wet meadows. Rarely reported; known from 10 sites in California, including 8 in the Sierra Nevada, 1 at Mount Lassen, and 1 on Mount Shasta; as well as from 12 sites outside of California. The diminutive stature and dull colors make this a difficult mushroom to spot (especially in habitats of dense graminoid vegetation); this may be a reason for the scarcity of records.

TAXONOMIC NOTES: Better known as *Weraroa cucullata*, genetic studies (Bridge et. al 2008) showed it belongs in the genus *Leratiomyces*.

DISTRIBUTION: Rare; known from high-elevation wet meadows and marshes in the Sierra and southern Cascades. Also in the Rocky Mountains and high plains. **USA:**

CA: Siskiyou Co., S-TNF, Mount Shasta, Wagon Camp. **Shasta Co.,** LVNP, Hat Lake. **Sierra Co.,** TNF, Chapman Creek Campground. TNF, Hasken Peak Road. **El Dorado Co.,** ENF, about 2.5 miles east of Silver Fork Road, off Packsaddle Pass Road. ENF, Haypress Meadows Road, 5 miles east of Silver Fork Road. **Amador Co.,** ENF, Silver Lake. **Tuolumne Co.,** StaNF, Cow Creek north of Pinecrest. StaNF, Herring Creek Road. YNP, Tuolumne Meadows. **Mariposa Co.,** YNP, meadow at headwaters of Meadow Brook. **OR:** 2 sites. **ID:** 1 site. **WY:** 3 sites. **CO:** 3 sites. **ND:** 1 site. **NM:** 1 site.

DESCRIPTION: **CAP** 1–2.5 cm tall, 0.5–1 cm across, cylindrical to narrowly conical, margin pinched and fused to stipe. Surface wrinkled, with scattered fine squamules, moist to dry, faintly striate. Creamy buff with scattered brownish squamules when young, becoming ochre-buff, with a paler creamy buff to creamy gray margin. **GILLS** narrowly attached, crowded, narrow, anastomosing. Brown to dark reddish brown. **STIPE** 3–10 cm long, 0.2–0.4 cm thick, slender, more or less equal. Surface dry, scurfy. Creamy buff at apex, darker, brownish towards base, covered with paler buff squamules. **PARTIAL VEIL** ephemeral, squamulose, leaving fragments on the young cap margin. **FLESH** very thin, ochre-buff. Stipe solid, stuffed with pith at all stages. **MICROSCOPY:** **Spores** 11.5–14.5 x 6.5–8 μm , ellipsoid to amygdaliform, end slightly truncate with an eccentric or apical germ pore, smooth, thick-walled, warm brown in KOH. **Cheilocystidia** abundant, 35–70 x 5–7.5 μm , filamentous-cylindric, hyaline to slightly yellowish in KOH. **Pleurocystidia** rare, up to 25 μm long, lageniform and slightly mucronate, mixed with swollen cells up to 15 μm broad. **Cap cuticle** composed of filamentous, granulose cells 2–3 μm broad, and up to 35 μm long. **Clamp connections** infrequent.

ECOLOGY: Saprobic. Fruiting bodies solitary or scattered in moist meadows, marsh edges or grassy streambanks; often in moss or grass. Fruiting in spring and summer, typically from snowmelt moisture.

SIMILAR SPECIES: *Galeropsis polytrichoides* has a darker brown cap and a distinctly fibrillose partial veil, often leaving remnants on the cap margin.

Photo: © Douglas Smith.

Marasmius thiersii

Desjardin

COMMON NAME:

SPECIES CODE:



FAMILY: Marasmiaceae

SYNONYMS: None

SUMMARY: A small mushroom with a dark reddish brown to dark brown cap, grayish buff gills, a pruinose to finely velvety stipe, a slight odor and strong alliaceous taste (similar to garlic or onions). Microscopically, it has smooth, ellipsoid spores, lacks hymenial cystidia, and has distinctive caulocystidia. Rare; currently known from four locations, (three montane, one coastal).

TAXONOMIC NOTES: Described by Desjardin (1987) from central Sierra Nevada foothills, in Amador County, California. Recent genetic work has led to reclassification of many *Marasmius*; based on preliminary data, it appears that this species belongs in the genus *Gymnopus*. A number of similar species might be mistaken for *Marasmius thiersii*, including a few that remain undescribed.

DISTRIBUTION: Rare; currently known from eight collections from four locations: Three in the northcentral Sierra Nevada foothills, and one on California's North Coast. **USA: CA: Yuba Co.**, TNF, Bullard's Bar Rec. Area. **Nevada Co.**, TNF, Highway 20, east of Nevada City. **Amador Co.**, Pine Grove, Irishtown Road

(Type). **Mendocino Co.**, Russian Gulch State Park, along Road 409.

DESCRIPTION: **CAP** 0.5–1 cm across, convex to nearly plane, margin even, to inrolled when dry. Surface smooth to rugulose, or rugulose-striate near margin in age, dull, dry. Dark reddish brown overall when young, remaining so, or becoming dark brown over disc, with a slightly lighter margin. **GILLS** broadly to narrowly attached, close, narrow. Buff to pale brownish gray when young, becoming pale grayish orange to grayish brown. **STIPE** 2.5–4.5 long, 0.1–0.3 cm thick, tapered downward, often with a small knob-like base, often longitudinally compressed. Surface dry, pruinose at apex, finely velvety lower to distinctly velvety at base. Black rhizomorphs rare or absent. Dark brown over apex, transitioning to a dark reddish brown midportion, to a blackish base. **FLESH** thin, tough, buff to light brown. **ODOR** mild to slightly unpleasant, like garlic. **TASTE** slowly, strongly garlic- or onion-like. **SPORE DEPOSIT** white. **MICROSCOPY:** **Spores** (7.2) 8–9 x 3.3–4.2 μm , ellipsoid, smooth, inamyloid. **Basidia** 24–33 x 4.8–6.6 μm , clavate, or stalked-spherical, 4-spored. **Cheilocystidia** and **pleurocystidia** absent. **Caulocystidia** at stipe apex 30–60 x 3–6 μm , with walls up to 1.5 μm thick; at stipe base 40–100 x 3–8.5 μm , with walls up to 2.5 μm thick, cylindric, gradually narrowing to a point, narrowly clavate, or constricted; walls dark brown, and strongly dextrinoid. **Cap cuticle** of repent hyphae with peg-like protuberances or small branches, smooth or with dark brown pigment incrustations. **Tramal hyphae** of pileus similar to cuticular hyphae but lacking pegs and branches. **Clamp connections** present.

ECOLOGY: Saprobic. Scattered to gregarious on duff, leaves and needles, fruiting in fall and early winter. Primarily on needle litter of pines (*Pinus* spp.), but occasionally on Tanoak (*Notholithocarpus densiflorus*) or Pacific Madrone (*Arbutus menziesii*) leaves.

SIMILAR SPECIES: *Gymnopus villosipes* is typically slightly larger, has a hygrophaneous cap with colors ranging from dark reddish brown to vinaceous brown when wet to light brown or even pale beige when dry. Its stipe is evenly covered with a fine coating of tiny hairs. It lacks any distinctive odor and has a mild taste. *Mycetinis copelandii* has a light brown cap, pallid gills, a minutely fuzzy stipe and a strong garlic odor. It's very common in fall on oak and Tanoak leaves. Fruit bodies of the *Gymnopus androsaceus* complex (including at least two undescribed species in our area) are typically smaller, and have thin, wiry black stipes with inconspicuous black rhizomorphs penetrating the surrounding substrate.

Photo: © Else Vellinga.

Mycena hudsoniana

A.H. Sm.

COMMON NAME:

SPECIES CODE: MYHU2



FAMILY: Mycenaceae

SYNONYMS: None

SUMMARY: This mushroom can be found in conifer litter and duff on the edges of melting snowbanks in spring. However, it may not be limited to this habitat. Many *Mycena* species look similar macroscopically; the spring fruiting and growth in duff, blackish to dark gray cap, grayish gills, and lack of or slightly fragrant odor help distinguish it. Microscopically, the broadly capitate to obpyriform cystidia, covered with bumpy to spiny outgrowths are important features to look for.

TAXONOMIC NOTES: Described by Smith (1941) from Olympic National Park, Washington. The reported collections from Minnesota and Alberta should be confirmed. Field identification of most *Mycena* species is impossible, and this species might have been overlooked, under sampled and/or misidentified.

DISTRIBUTION: Described from the Olympic Peninsula in Washington, with scattered locations in the Cascades in Washington and Oregon, and a single known site in northern California; also recorded from Idaho and coastal British Colum-

bia (Canada). **USA: CA: Siskiyou Co.**, S-TNF, near Harris Springs. **OR:** 1 site. **WA: Clallam Co.**, Olympic National Forest, Deer Lake (Type). 8 sites. **ID:** 1 site. **CANADA: BC:** 1 site.

DESCRIPTION: CAP 2–5cm across, obtusely conic, expanding slightly, typically broadly umbonate to bell-shaped in age. Surface moist to dry, translucent-striate when wet, smooth, or faintly sulcate in age. Blackish on disc, dark gray toward margin, fading to pale gray; hygrophanous, fading greatly if dry. **GILLS** broadly attached, often with a decurrent tooth, close to crowded, narrow, thin. Pale smoky gray, edges concolorous or paler. **STIPE** 3–5 cm long. 0.15–0.3 cm thick, equal. Surface dry, often with a faint hoary bloom when young, soon polished and watery. Dark gray to smoky gray, slightly paler towards apex. Hollow. **FLESH** thin, fragile, concolorous with surface. **ODOR** indistinct to faintly fragrant. **TASTE** mild, or slightly unpleasant. **SPORE DEPOSIT** white. **MICROSCOPY:** Spores 8–11 (12) x 5–6 μm , (Maas Geesteranus's Type study reported spores 8.1–8.8 x 4.9–5.4 μm) narrowly ellipsoid to pip-shaped, smooth, amyloid. **Basidia** 22.5–22 x 7–8 μm , 4-spored (occasionally 2-spored). **Cheilocystidia** and **pleurocystidia** abundant, 21–50 x (8) 15–25 (40) μm , capitate to obpyriform (pear-shaped with the wide end outwards), enlarged part finely spiny, hyaline. Also, infrequently to rare, irregularly shaped **cystidia** present; covered with unevenly spaced, longer, coarser, sometimes branched excrescences. **Clamp connections** present in all parts.

ECOLOGY: Solitary or scattered in duff, typically fruiting on the edges of melting snowbanks in spring. Saprobic on duff of conifers.

SIMILAR SPECIES: *Mycena overholtsii*, a common snowmelt species, can easily be distinguished by its growth from decaying stumps and logs, often in large clusters, the larger size and bell-shaped, convex to nearly plane caps, and the general non-mycena look. *Mycena amicta* is smaller and has a bluish to bluish gray cap when young, soon fading to grayish. It typically retains a blue stipe base. Other duff-dwelling *Mycena* species typically don't fruit on the edges of melting snowbanks, however, microscopic examination is necessary to identify any mycena.

Mycetinis applanatipes

(Desjardin) A.W. Wilson and Desjardin

COMMON NAME:

SPECIES CODE: MAAP3



FAMILY: Marasmiaceae

SYNONYMS: *Marasmius applanatipes* Desjardin

SUMMARY: A small mushroom with a reddish brown cap (color fades in age), fairly widely spaced gills, a pubescent to velvety stipe and a strong garlic odor. It typically grows in small clusters or 'tufts' of a few fruit bodies, in duff and needle debris of Red Fir, or other conifers in higher elevation forest. Currently known from 10 sites, 7 in California.

TAXONOMIC NOTES: Described as *Marasmius applanatipes* by Desjardin (1987) from Yuba Pass, Sierra County, California. Later transferred to the genus *Mycetinis* (Wilson & Desjardin, 2005).

DISTRIBUTION: Known from 10 sites. Seven are in California in high-elevation conifer forests in the northern Sierra Nevada, Cascade and Klamath ranges, two sites are in Oregon and there is a single site in British Columbia. **USA: CA: Siskiyou Co.**, KNF, Scott River Ranger District, Russian Wilderness. KNF, Carter Meadow. S-TNF, Mount Shasta, Sand Flat. S-TNF, near Toad Mountain. **Sierra Co.**, TNF, Yuba Pass (Type). TNF, Chapman Creek Campground. **Placer Co.**,

TNF, Yuba Gap. **OR:** 2 sites. **CANADA:** BC: 1 site.

DESCRIPTION: **CAP** 1–1.8 cm across, convex to plane, at times shallowly depressed at disc. Surface smooth to rugulose-striate, dull, subhygrophanous. Dark reddish brown overall when young, fading from the margin inward as it ages; dark brown at disc, brown to light brown mid-portion and brownish gray, grayish orange, or pinkish buff at margin. **GILLS** broadly to narrowly attached, subdistant or distant, moderately broad, buff, orangish white to grayish orange when young, darkening with age. **STIPE** 3–4 cm long, 0.15–0.4 cm thick, tapered downward, often longitudinally compressed. Surface dry; apex pubescent, finely velvety to tomentose lower. Orange-white to brownish orange at apex; brownish gray, brown, to dark reddish brown towards base. **FLESH** thin, somewhat leathery, light brown to brownish gray. Stipe tough, cartilaginous. **ODOR** pungent, like garlic and rotting cabbage. **TASTE** garlic-like. **MICROSCOPY:** **Spores** 8.7–10.2 (12) x 4.8–6 (6.6) μm , broadly ellipsoid to amygdaliform, smooth, inamyloid. **Basidia** 40–48 x 7.5–9 μm , clavate, 2- or 4-spored. **Cheilocystidia** scattered, 33–48 x 6–9 μm , cylindrical, clavate, often forked, and with a few short lateral knobs. **Pleurocystidia** absent. **Cap cuticle** a hymeniform of two cell types; pyriform to clavate, stalked hyaline to pale yellow, thin-walled cells, 24–30 x 5.4–12 μm ; and variable-shaped, thick-walled scattered cells, or chains of cells, 5.4–12 μm across, with brown walls. **Caulocystidia** clustered, 42–78 x 5.4–9 μm , irregularly cylindrical or constricted, rarely lobed, obtuse, pale yellowish, thin-walled. **Clamp connections** present.

ECOLOGY: Saprobic. Scattered to gregarious, often in small fused clusters, on conifer duff and needles. Most collections are found in Red Fir (*Abies magnifica*) forests. Typically found in high-elevation forests above 2000 m.

SIMILAR SPECIES: *Mycetinis copelandii* has a light brown cap, pallid gills, a minutely fuzzy stipe and a strong garlic odor. It's very common in fall on oak and Tanoak (*Notholithocarpus densiflora*) leaves. *Mycetinis salalis* is nearly indistinguishable from *M. copelandii* macroscopically, except by its substrate; it grows on the leaves of Salal (*Gaultheria shallon*) and Oregon grape (*Berberis* spp). *Gymnopus villosipes* is typically slightly larger, has a hygrophanous cap with colors ranging from dark reddish brown or vinaceous brown when wet, to light brown or beige when dry. The stipe is evenly covered with a fine coating of tiny hairs. It lacks a distinctive odor and has a mild taste. *Marasmius thiersii* has a dark reddish brown to dark brown cap, grayish buff gills, a pruinose to finely velvety stipe, a slight odor and strong alliaceous taste. It also occurs on conifer duff, but more often on pine needles.

Photo: © Dennis Desjardin.

Mythicomycetes corneipes

(Fr.) Redhead & A.H. Sm.

COMMON NAME:

SPECIES CODE: MYCO11



FAMILY: Mythicomycetaceae

SYNONYMS: *Agaricus corneipes* Fr., *Geophila corneipes* (Fr.) Quél., *Psilocybe corneipes* (Fr.) P. Karst.

SUMMARY: A small mushroom with an orange-brown, hygrophanous cap, cartilaginous stem that darkens from the base up, pale purple-brown spores, and amyloid incrustations on the cystidia. Widespread but uncommon; appears to be restricted to mature and old-growth forests. Currently known from three voucher-confirmed locations in California, and a single site for which microscopic examination was done, but no collection saved.

TAXONOMIC NOTES: Described from Sweden by Fries (1861), and often referred to as *Psilocybe corneipes* until Redhead & Smith (1986) coined the genus *Mythicomycetes* to accommodate *M. corneipes*. Redhead et al. (2011) corrected an incorrect citation used in the 1986 publication, validating the name. *Mythicomycetes corneipes* is easily confused with several macroscopically similar species; identification is easily confirmed microscopically. *Mythicomycetes* forms a close-knit group with *Stagnicola*, in a sister family to Psathyrellaceae.

DISTRIBUTION: Widespread, known from the northern Sierra Nevada northwards into Alaska, and east into the Rocky Mountains. Also reported from eastern North America and Europe. A foray species list indicates a record from coastal Mendocino County, but is not accompanied by a specimen or photos. **USA: CA: Siskiyou Co.**, S-TNF, Cold Creek southwest of Military Pass Road. S-TNF, 1 mile southeast of Red Tank Spring. **Shasta Co.**, LNF, Poison Creek, north of 38N10. **Sierra Co.**, TNF, Chapman Creek Campground (unconfirmed). **OR:** 4 sites. **WA:** 22 sites. **AK:** 1 site. **ID:** 8 sites. **UT:** 1 site. **CO:** 6 sites. **MI:** 6 sites. **NY:** 1 site. **CANADA: BC:** 7 sites. **ON:** 1 site. **NS:** 2 sites.

DESCRIPTION: CAP 1–3 cm across, bell-shaped to broadly convex, occasionally with an umbo. Surface smooth, moist to dry, margin even, translucent-striate when wet. Orange to orange-brown, fading to ochre-brown; strongly hygrophanous, fading to tan when dry. **GILLS** narrowly attached with a slight notch to seceding, close, broad, pallid to beige, becoming tan, and often with olivaceous tones in age. **STIPE** 3–6 cm long, 1–2 mm wide at the apex, equal, often curved or twisted. Surface moist to dry; apex finely scurfy when young, soon smooth; lower portion with sparse coarse hairs, base with ochre mycelium. Yellow-brown to orange-brown at apex, transitioning to dark reddish brown, blackening from the base up in age. **FLESH** thin, brownish in cap. Stipe tough, cartilaginous-fibrous. **ODOR** indistinct to faintly geranium-like. **TASTE** indistinct to slightly bitter. **SPORE DEPOSIT** pale purple-brown. **MICROSCOPY:** **Spores** 6–8.5 x 4–5.5 μm , ovoid to subellipsoid, ornamented with scattered short ridges and projections, dextrinoid. **Basidia** 24–26 x 6–8.5 μm , clavate, 4 spored. **Pleurocystidia** numerous, 43–86 x 10–24 μm , walls up to 3 μm thick, fusoid ventricose with rounded tips often encrusted with amyloid crystals. **Cheilocystidia** similar, 37–46 x 10.5–14 μm . **Pileipellis** a gelatinized ixocutis consisting of radially arranged cells 1–4 μm broad, subpellis composed of enlarged barrel-shaped cells 8–15 μm broad. **Clamp connections** present.

ECOLOGY: Saprobic; fruiting bodies solitary or scattered in soil, moss, duff or grass thatch along stream banks, or in wet seeps, with an affinity for old-growth conifer forest. Habitat is like that of many *Botrychium* species in California. Fruiting in late summer and fall.

SIMILAR SPECIES: Macroscopically, *Stagnicola perplexa* is very similar, and can be difficult to distinguish; it is usually slightly paler, and has a discernibly bitter taste. Microscopically, it lacks encrusted cystidia, and has smooth spores. Many *Galerina* species are similar, but all have rusty brown spores. *Phaeocollybia attenuata* can also look similar, but has a rooting, wire-like stipe base, reddish brown spores, roughened, lemon-shaped spores and lacks pleurocystidia.

Phaeocollybia benzokauffmanii

Norvell

COMMON NAME:

SPECIES CODE:



FAMILY: Hymenogastraceae

SYNONYMS: None

SUMMARY: A large mushroom with a viscid, smoky violet to pinkish brown cap which becomes dark vinaceous brown to dark brown in age, pallid whitish to yellowish gray gills and a deeply rooted stipe with a pinkish gray to purple-gray apex. Additional identifying features include the solid stipe stuffed with a whitish pith, and roughened spores averaging $9 \times 5.5 \mu\text{m}$. Rare in California; likely restricted to mature and old-growth forests.

TAXONOMIC NOTES: Until it was described by Norvell (2000) from Van Damme State Park, Mendocino County, California, *Phaeocollybia benzokauffmanii* was included in the concept of *P. kauffmanii*. Past collections have been examined and properly identified, and this species has been included in a recent guide (Desjardin et al. 2015).

DISTRIBUTION: Rare in California; currently known from five sites on the North Coast and two unconfirmed reports in the Klamath Range. Uncommon to rare in Oregon and Washington. (NOTE: Norvell & Exeter (2008) referenced “~35 lo-

calities from northwestern California into northern Washington.” Based on collections listed on MyCoPortal, there appear to be ~25 localities). **USA: CA: Del Norte Co.**, Jedediah Smith State Park. **Humboldt Co.**, RNP, Davison Road. **Mendocino Co.**, Jackson State Forest, near 408-409 junction. Jackson State Forest, “Aleuria Glen.” Van Damme State Park, upper portion (Type). **OR:** ~12 sites. **WA:** 8 sites.

DESCRIPTION: CAP 4–15 cm across, obtusely conical when young, expanding to convex or nearly plane with broad umbo. Margin inrolled when young, becoming wavy and uplifted; outer edge inrolled at all stages. Surface smooth, viscid to glutinous when wet, tacky when dry. Color variable, often variegated with various shades of smoky violet, pinkish, lilac to purplish brown, typically with a darker disc, and dark spots or splotches. As it ages, brownish and orangish tones become more prominent; dark vinaceous brown, dark reddish brown or dark brown when old. Dry caps metallic, and darker: blackish brown to vinaceous, or reddish brown. **GILLS** narrowly attached to appearing free, crowded, broad. Whitish to pale pink or grayish when very young, soon developing smoky tones, and dark yellowish gray in age. **STIPE** 3.5–10 cm long above ground, up to 25 cm long overall, 0.7–3 cm thick at apex, equal or swollen towards ground level, tapering to an often deeply rooted pseudorhiza underground. Surface dry, smooth to appressed-fibrillose, longitudinally lined (occasionally the cartilaginous rind will crack longitudinally). Pale pinkish gray to purple-gray at apex, transitioning to a deep purple-brown or red-brown lower portion when young, darkening from the base up in age. Pseudorhiza deep red brown overall. **FLESH** firm, thin, except at disc; whitish, tinged with pink or purplish tones in cap, slowly staining cinnamon. Stipe solid, with a dark cartilaginous rind, and firm pallid to whitish pith, slowly staining cinnamon brown when cut. **ODOR** slightly floral, or sweet farinaceous. **TASTE** farinaceous to slightly bitter. **SPORE DEPOSIT** pale purplish to dull yellowish brown. **MICROSCOPY: Spores** 8.2–10 x 5–6 μm , averaging 9 x 5.5 μm , fusoid-ellipsoid in face view, somewhat lemon-shaped in side view, coarsely roughened, except near beaked apex, with eccentric apiculus. Amber in KOH, dextrinoid in Melzer’s reagent. **Basidia** 27–38 x 6–7.5 μm , clavate, with a short pedicel, 4-spored. **Cheilocystidia** forming a dense gelatinous layer on gill edge. Highly variable in length and shape; a mix of narrowly and broadly clavate elements, with tips 3 μm when young, to 5–7 μm when mature. Often with long filamentous outgrowths when old. **Pleurocystidia** absent. **Cap cuticle** a two-layered ixocutis; upper layer 100–300 μm thick, consisting of radially aligned, cylindrical, highly gelatinized, hyaline hyphae, 3–6 μm across in a tightly compacted gelatinous matrix. Lower layer 50–100 μm thick, dull orange brown, made up of slightly thick-walled

hyphae, 5–8 μm across. **Clamp connections** absent.

ECOLOGY: Ectomycorrhizal with conifers (and possibly Tanoak, *Notholithocarpus densiflorus*), apparently restricted to mature and old-growth forests. Fruit bodies solitary or scattered in small patches, appearing in fall and early winter.

SIMILAR SPECIES: Fruit bodies of *Phaeocollybia redheadii* are typically slightly larger, have reddish brown to dark brown caps (even when young), long rooting stipes stuffed with cream-colored pith, and larger spores. Older specimens of *P. benzokauffmanii* can be difficult to distinguish macroscopically; in such cases, *P. redheadii* can be distinguished by its larger spores measuring (8) 9–13 x 5–7.3 μm , averaging 10.5 x 6 μm . *Phaeocollybia spadicea* has a dark brown to gray-brown cap that develops vinaceous tones in age; it is typically smaller (caps 2.5–12 cm across), has darker gills, slightly smaller spores (8 x 5 μm), and has tibiiform to lageniform cheilocystidia with narrow, thick-walled necks. *Phaeocollybia oregonensis* has a grayish to grayish brown cap, smoky-white to dark yellowish brown gills, a solid stipe stuffed with white pith, with a grayish pink apex and dull yellowish cinnamon spores. Microscopically, it has small, nearly smooth spores, (6.8 x 4 μm), and thin-walled, narrowly clavate cheilocystidia, which develop apical outgrowths in age. *Phaeocollybia kauffmanii* has a viscid, orange-brown to warm brown cap, a solid stipe with a pinkish buff to cinnamon buff apex, and a strongly farinaceous odor and taste.

Phaeocollybia gregaria

A.H. Smith & Trappe

COMMON NAME:

SPECIES CODE: PHGR23



FAMILY: Hymenogastraceae

SYNONYMS: None

SUMMARY: A medium-sized phaeocollybia with a golden tan to brown, conical to bell-shaped cap, smoky white to pale cinnamon gills, a tall, slender rooting stipe with an ivory to tan apex and an orange base. Microscopically, the variably clavate, thin-walled cheilocystidia, and large spores help distinguish it. It typically grows in large gregarious clusters under conifers. Very rare; known from the Klamath Range in California, and the central and northern Oregon coast.

TAXONOMIC NOTES: Described by Smith and Trappe (1972) from Cascade Head Experimental Forest in Oregon. The identity of Californian collections should be confirmed.

DISTRIBUTION: Rare in California; currently known from five sites in the Klamath Range. Also found on the Oregon coast. A single collection from Olympic National Park in Washington may represent this species. (NOTE: Norvell & Exeter (2008) referenced five sites from Polk, Tillamook, Lincoln and Benton Counties in Oregon. Four of these are not listed on MyCoPortal). **USA: CA: Siskiyou Co.,**

KNF, two sites (locations unknown). **Trinity Co.**, SRNF, two sites (locations unknown). S-TNF, (locations unknown). **OR: Tillamook Co.**, Cascade Head Experimental Forest (Type).

DESCRIPTION: CAP 3–6 (10) cm across, conic at first, expanding to broadly conical to bell-shaped; with a distinct umbo. Margin incurved at first, becoming wavy and uneven. Surface smooth, slimy to thinly viscid when wet; hygrophanous, fading when dry. Golden to smoky tan when young, occasionally two-toned, with a darker brown disc and paler margin, soon darkening to chestnut-brown or cocoa-brown, and sometimes with grayish tones in age. **GILLS** narrowly attached to nearly free, close to crowded, moderately broad. Smoky white to light cinnamon when young, developing cinnamon color as spores mature, to dull cinnamon in age. **STIPE** 3–7 cm long above ground, 20 cm overall, 0.8–1.5 thick at apex, equal or tapered downwards, pseudorhiza equal with stipe for about half of its length, then tapered to a slender ‘root’. Surface dry to lubricous, smooth or with scattered fibrils, finely longitudinally lined. Ivory to tan, occasionally with a pinkish cast near apex, transitioning to a red-orange to orange-brown color at ground level; darkening from the base up in age. Pseudorhiza dark red-brown, staining red-orange to maroon. **FLESH** very thin, somewhat cartilaginous, off-white to tan. Stipe solid, stuffed with fibrillose pith. Pith whitish to pale tan, staining tan, rind concolorous with exterior. **ODOR** indistinct to slightly floral. **TASTE** indistinct. **SPORE DEPOSIT** dark cinnamon brown to dark red-brown. **MICROSCOPY:** **Spores** (8) 9–10 (11) x 5.3–6 (7) μm , averaging 9.6 x 5.7 μm , amygdaliform, with an eccentric apiculus and small, smooth beak in side view, punctate to roughened, amber in KOH. **Basidia** 30–40 x 6–9 μm , clavate, with a rounded upper portion, 4-spored. **Cheilocystidia** 20–35 μm long, 2–3 μm wide, abundant, thin-walled, hyaline. Highly variable, and often in a fused mass; difficult to separate into isolated elements when studying dried material. Variably clavate, cylindrical or inflated, with rounded to pointed heads, often with thread-like extensions in age. **Pleurocystidia** absent. **Cap cuticle** a two-layered ixocutis; upper layer ~400 μm thick, uplifted, highly gelatinized, hyaline hyphae, 1–2 μm wide; loosely embedded in a gelatinous matrix. Lower layer; wider (4–7 μm) gelatinized hyphae, with dull orange-brown diffused pigments. **Clamp connections** absent.

ECOLOGY: Ectomycorrhizal with conifers; sites in California have Douglas-fir (*Pseudotsuga menziesii*), White Fir, (*Abies concolor*), and Western Hemlock (*Tsuga heterophylla*). Oregon sites are dominated by Western Hemlock and Sitka Spruce (*Picea sitchensis*). This species is likely restricted to mature and old-growth forests. Fruiting in small to large clusters (rarely solitary) in soil, typically in areas with thick duff. Fruiting in fall.

SIMILAR SPECIES: *Phaeocollybia olivacea* has an olive-green cap, and yellowish green gills and stipe apex, as well as coarsely roughened spores with a longer beak. *Phaeocollybia spadicea* has a darker brown to gray-brown cap that develops vinaceous tones in age. It also has darker gills, slightly smaller spores (8 x 5 μm), and tibiiform to lageniform cheilocystidia with narrow, thick-walled necks.

Photo: © Ron Exeter.

Phaeocollybia olivacea

A.H. Sm.

COMMON NAME: Olive Phaeocollybia

SPECIES CODE: PHOL



FAMILY: Hymenogastraceae

SYNONYMS: None

SUMMARY: A medium-sized mushroom with an olive-green, viscid to dry cap, pale yellowish gills, and a rooting stipe. Often fruiting in large arcs and rings in mid to late seral stage and old-growth forests. Ectomycorrhizal; occurring with both conifers, (especially Douglas-fir and Sitka Spruce), and hardwoods (especially Tanoak). Known from over 100 collections in California: 50 sites in the Klamath Range in California, in Six Rivers, Klamath and Shasta-Trinity National Forests, 30+ sites in coastal California, from Santa Cruz County north, and 4 sites in the Sierra Nevada in Eldorado and Tahoe National Forests. Based on the number of known locations, this species should be considered common, and is not in need of protection in the Klamath or coast provinces. The relative rarity of this species in the Sierra Nevada is likely due to limited appropriate habitat. Known Sierra Nevada sites are in mature and old-growth mixed conifer-Tanoak forest.

TAXONOMIC NOTES: The name *Phaeocollybia olivacea* has been misapplied to collections of the similar *P. fallax*, and *P. pseudofestiva*. All three can grow in close proximity; some collections identified as *P. olivacea* contain fruit bodies of two or

three of these species.

DISTRIBUTION: Common in the Klamath Range in California and Oregon, common in suitable habitat in the Oregon Coast Range, uncommon in the Oregon Cascade foothills, locally common on the North Coast of California, occurring south to Santa Cruz County. Rare in the Sierra Nevada. **USA: CA: Siskiyou and Trinity Counties:** KNF, S-TNF, SRNF, ~50 sites. **Santa Cruz Co.,** 3 sites. **San Mateo Co.,** 1 site. **Marin Co.,** 4 sites. **Sonoma Co.,** 2 sites. **Mendocino Co.,** 14 sites. **Humboldt Co.,** 7 sites. **Del Norte Co.,** 3 sites. **Yuba Co.,** TNF, Bullards Bar Recreation Area, downhill from Schoolhouse Campground. TNF, Bullards Bar Recreation Area, near Hornswoggle Group Campground. TNF, Bullards Bar Recreation Area, Rebel Ridge. **El Dorado Co.,** Eldorado National Forest, (past Georgetown) **OR:** 75+ sites.

DESCRIPTION: CAP 3.5–10 (12) cm across, conical with an incurved margin at first, becoming broadly conical to convex, often with a low umbo. Margin becoming wavy and slightly uplifted in age. Color variable; dark olive to olive-green or forest green when young, becoming olive-green, orangish green to brownish olive or even reddish olive in age. Strongly hygrophorous, fading when dry. Surface smooth to slightly wrinkled, viscid and shiny when wet, becoming dull when dry. **GILLS** Narrowly attached or appearing free at times, close to crowded. Dingy yellow to pale greenish yellow when young, often with reddish spots and stains, becoming yellowish brown to dirty reddish brown in age. **STIPE** 7–14 cm long aboveground, up to 22 cm long overall, 0.8–2 cm thick, equal or slightly enlarged toward lower stipe and tapering to a long root underground. Drab yellowish to greenish buff on upper portion, darker, orange-red on lower stipe when young, becoming reddish to orange-brown from base up in age, but often staying paler buff-brown at apex. **FLESH** thin, greenish in cap. Stipe stuffed with solid white to ivory silky-fibrous pith that stains reddish brown, with a fibrous to cartilaginous reddish to watery gray rind-like skin. **ODOR** farinaceous to cucumber-like. **TASTE** indistinct. **KOH** orange on cap, reddish brown on flesh. **SPORE DEPOSIT** rusty brown. **MICROSCOPY:** Spores 8–11 x 5–7 μm , average 10 x 6 μm , broadly ovoid with an abruptly projecting snout in face view, flattened on one side in side view, roughened or warty with dark ornamentation with a smooth apical beak. **Basidia** 25–40 x 7–9 μm , clavate, 4-spored, colorless in KOH. **Pleurocystidia** absent. **Cheilocystidia** abundant, highly variable in length, thin-walled, variably clavate with narrow elements, 3–4 μm wide, intermixed with wider elements, 5–7 μm wide. Typically developing apical extensions in age. **Cap cuticle** a two-layered ixocutis. Top layer approximately 400 μm , thick; a thick gelatinous matrix surrounding radially aligned, narrow cylindrical to inflated colorless hyphae. Lower layer approxi-

mately 400 µm thick; thin-walled hyphae, 5–10 µm wide, with pale to dark orange-brown pigments irregularly within the walls in older specimens. **Clamp connections** absent.

ECOLOGY: Ectomycorrhizal with conifers and hardwoods; apparently restricted to mature and old-growth forests. Often fruiting in arcs and rings, less often solitary or scattered, typically in areas with thick duff. Fruiting in fall and early winter.

SIMILAR SPECIES: Most similar is the rare *Phaeocollybia pseudofestiva*, which also has a greenish cap and drab yellowish gills. Macroscopic differences between these two are slight: *P. pseudofestiva* is typically smaller and has a distinctly green stipe apex when young. Microscopically, *P. pseudofestiva* is easily distinguished by its relatively thick-walled cheilocystidia that are bottle-shaped or cylindrical with abruptly rounded heads. *Phaeocollybia fallax* is a common green-capped species distinguished by its lilac gills when young; in age, the gills lose their distinctive color, and mature fruit bodies of the two species can be difficult to distinguish—in such cases, the smaller size, hollow stipe and smaller spores (9 x 5.3 µm on average) help distinguish it.

Phaeocollybia pseudofestiva

A.H. Sm.

COMMON NAME:

SPECIES CODE: PHPS3



FAMILY: Hymenogastraceae

SYNONYMS: None

SUMMARY: A small to medium-sized phaeocollybia with a green cap, pallid yellow gills when young, and a greenish rooting stipe filled with a pithy core (at least when young). Macroscopically, it is very similar in appearance to the green-capped *P. olivacea* and *P. fallax* and can grow intermingled with one or both these species. Microscopic examination is necessary to positively identify mature specimens. In California, this species is known from 14 sites: 9 sites on the coast, occurring as far south as Santa Cruz County, and 5 sites in the Klamath Range.

TAXONOMIC NOTES: Described by Smith (1957), from near Crescent City, California. *Phaeocollybia pseudofestiva* is often mistaken for the more common *P. olivacea* and *P. fallax*. All three can grow in close proximity; some collections identified as *P. pseudofestiva* contain fruit bodies of two or three of these species.

DISTRIBUTION: Rare in California: currently known from nine sites on the coast from Santa Cruz County northward, as well as from five sites in the Klamath Range. Uncommon in Oregon; mostly in the Coast Range, with scattered sites in

the western Cascades, occurring into southern British Columbia (rare north of Oregon). **USA: CA: Del Norte Co.**, Crescent City (Type). **Siskiyou Co.**, KNF, two sites (locations unknown). **Humboldt Co.**, Prairie Creek Redwoods State Park, Ruggs Grove. Trinidad, Spruce Grove. Cape Mendocino, south of Camp Wailaki. **Trinity Co.**, SRNF, two sites (locations unknown). S-TNF, (locations unknown). **Mendocino Co.**, Jackson State Forest, near 408-409 junction. Van Damme State Park, Fern Canyon Trail. **Marin Co.**, Audubon Canyon Ranch, Volunteer Canyon. **Santa Cruz Co.**, Big Basin State Park. Boulder Creek. **OR:** ~25 sites. **WA:** 3 sites. **CANADA: BC:** 2 sites.

DESCRIPTION: CAP 2.5–7 (10) cm across, broadly conical to acutely convex at first, becoming more bell-shaped, to obtusely bell-shaped. Margin incurved to slightly uplifted, immediate edge inrolled to downcurved. Surface viscid to glutinous when wet, smooth, hygrophanous; dull when dry. Dark olive-green overall, or with a darker disc and brighter yellowish green margin when young, becoming duller greenish olive to greenish brown, then darkening to dark olive to olive-brown in age. **GILLS** narrowly attached to nearly free, close to crowded, broad. Pale yellow, dingy cream or greenish buff when young, developing ochraceous tones, to olivaceous brown in age. **STIPE** 3–7 cm long above ground, 20+ overall, 0.4–1.3 cm thick at apex, equal, enlarged or tapered slightly towards ground level, rooting pseudorhiza tapering (abruptly at times) belowground to a fragile cord. Surface dry to moist, with scattered scurfy fibrillose patches, to nearly smooth in age. Greenish to pinkish buff at apex, transitioning to a dark green to yellow-brown or red-brown base; darkening overall in age. Pseudorhiza dark orange to red-brown. **FLESH** thin, firm, dull greenish yellow to whitish. Stipe solid, with a thin cartilaginous rind, stuffed with pale greenish white to pinkish-buff pith when young, sometimes becoming hollow in age or when insect infested. **ODOR** indistinct, or occasionally sweet or pungent. **TASTE** indistinct. **SPORE DEPOSIT** pinkish cinnamon-brown. **MICROSCOPY: Spores** (6.5) 7–9 (9.5) x (4) 4.5–5.5 μm , averaging 8 x 5 μm , ovate with long narrow beak in face view, inequilaterally lemon-shaped with central beak and eccentric apiculus in side view, coarsely to warty roughened, except near beak. Medium amber in KOH, inamyloid and non-dextrinoid in Melzer's reagent. **Basidia** 25–32 x 6–9 μm , clavate, 4-spored. **Cheilocystidia** 25–80 μm long, lageniform to tibiiform, (bottle-shaped, or with extended cylindrical necks), lower portion thin-walled, 3–7 μm wide, with narrow, thick-walled necks, 0.5–2 μm wide, with, or without a capitate head. **Pleurocystidia** absent. **Cap cuticle** a two-layered ixocutis; upper layer 100–250 μm thick, radially aligned, cylindrical, highly gelatinized, hyaline hyphae, 1–3 μm wide; in thick gelatinous matrix. Lower layer diffusely pigmented, gelatinized hyphae 8–15 μm wide; en-

crusted with pale greenish amber pigments, which turn orange in KOH. **Clamp connections** absent.

ECOLOGY: Ectomycorrhizal with conifers and possibly Tanoak (*Notholithocarpus densiflorus*); apparently restricted to mature and old-growth forests. Solitary, scattered or clustered in small patches in soil; typically in areas with thick duff. Fruiting in fall and early winter.

SIMILAR SPECIES: *Phaeocollybia olivacea* is typically slightly larger, and typically has a paler yellowish green stipe apex. The cheilocystidia are thin walled, variably clavate, and often have threadlike extensions in age (versus relatively thick-walled cheilocystidia, which are bottle-shaped or cylindrical with or without abruptly rounded heads on *P. pseudofestiva*). Microscopic examination is usually necessary to distinguish these two species; especially with older fruit bodies. *Phaeocollybia fallax* also has a green cap, but has distinctly lilac gills when young, and a hollow stipe. In age, the gills lose their distinctive color; in such cases, the thin-walled, clavate to capitate cheilocystidia readily distinguish it.

Phaeocollybia scatesiae

A.H. Sm. & Trappe

COMMON NAME:

SPECIES CODE: PHSC13



FAMILY: Hymenogastraceae

SYNONYMS: None

SUMMARY: A small to medium-sized mushroom recognized by its growth in large clusters, conic to bell-shaped, yellowish brown to dark reddish brown or blackish brown cap, yellowish, pinkish to cinnamon gills, a slender, hollow, rooting stipe (tapering to a fused point), and large, roughened, lemon-shaped spores with short beaks. Rare in California, known from the coast and Klamath Range; may occur in the Sierra foothills.

TAXONOMIC NOTES: Described by Smith and Trappe (1972) from Cascade Head Experimental Forest in Oregon.

DISTRIBUTION: Rare in California; currently known from six sites on the North Coast and Klamath Range. Uncommon in Oregon; mostly in the Coast Range, with scattered sites in the western Cascades, and Olympics in Washington. **USA:** **CA:** Del Norte Co., near Crescent City. **Trinity Co.,** S-TNF, near Forest Glen. **Mendocino Co.,** Van Damme State Park. **Humboldt Co.,** King Range Conservation Area, along King Peak Rd. Lord Ellis Summit. **Santa Cruz Co.,** Henry Cowell

Redwoods State Park, Fall Creek Unit. **OR:** ~25 sites. **WA:** 8 sites.

DESCRIPTION: **CAP** 2–6cm across, obtusely conic when young, becoming broadly bell-shaped, with a broad to pointed umbo. Margin inrolled when young, becoming down-curved to even, or wavy in age. Surface smooth, glutinous to viscid, hygrophanous. Yellowish brown when young, typically darker on disc, becoming orange-brown, dark reddish brown or blackish brown. **GILLS** narrowly attached, crowded, narrow. Pale yellowish to pale pinkish white at first, developing cinnamon color, becoming dingy yellow-brown in age. **STIPE** 4–7 (10) cm long above ground, up to 25 cm overall, 0.4–1.2 cm thick at apex, equal, pseudorhiza tapering downwards to a fused point. Surface smooth, dry to lubricous. Pale pinkish tan to orange buff at apex, cinnamon to orange lower, becoming dark orange-brown from base up in age. Pseudorhiza salmon-colored. **FLESH** thin, cartilaginous, buff. Stipe hollow, cartilaginous rind concolorous with exterior. **ODOR** indistinct, slightly floral, or slightly farinaceous in age. **TASTE** indistinct to slightly bitter when young. **SPORE DEPOSIT** yellowish brown. **MICROSCOPY:** **Spores** 7.2–9.5 x 4.5–5.6 μm , averaging 8.5 x 5 μm , ovate in face view, lemon-shaped with eccentric, short apiculus and central 1 μm long beak in side view, roughened-warty, pale rusty brown in KOH, non-dextrinoid in Melzer's reagent. **Basidia** 26–34 x 5–6.5 μm , 4-spored. **Cheilocystidia** lageniform to capitulate-tibiiform, base ~20 μm long, ~5 μm wide, necks ~3 μm wide, thick-walled. **Pleurocystidia** absent. **Cap cuticle** a two-layered ixocutis; upper layer 100–300 μm thick, radially aligned, uplifted, narrow hyaline hyphae, 1–3 μm wide; embedded in a gelatinous matrix. Lower layer with wider (4–15 μm) thick-walled, gelatinized hyphae with brownish to brownish orange walls in KOH. **Clamp connections** absent.

ECOLOGY: Ectomycorrhizal with conifers and possibly Tanoak. California sites have Douglas-fir (*Pseudotsuga menziesii*), Grand Fir, (*Abies grandis*), Western Hemlock (*Tsuga heterophylla*), and Tanoak (*Notholithocarpus densiflorus*). This species may be restricted to mature and old-growth forests. Fruiting in small to large clusters in soil, typically in areas with thick duff. Fruiting in fall.

SIMILAR SPECIES: *Phaeocollybia gregaria* has a golden-tan to brown, conical to bell-shaped cap, smoky white to pale cinnamon gills, a tall, slender rooting stipe with an ivory to tan apex and orange base. Microscopically, it has variably clavate, thin-walled cheilocystidia, and large spores (9.6 x 5.7 μm). *Phaeocollybia spadicea* has a darker brown to gray-brown cap that develops vinaceous tones in age; it also has darker gills, slightly smaller spores (8 x 5 μm), and tibiiform to lageniform cheilocystidia with narrow, thick-walled necks.

Photo: © Christian Schwarz.

Russula mustelina

Fr.

COMMON NAME:

SPECIES CODE: RUMU9



FAMILY: Russulaceae

SYNONYMS: None

SUMMARY: A medium-sized to large firm mushroom with a highly variable cap color ranging from creamy white to pale yellow, pink-blushed and mottled with vinaceous red, or completely vinaceous to red-brown. Additional identifying features include the creamy gills, pale yellow spores, white stipe which occasionally stains brownish, very firm flesh and growth in late summer and fall under true firs. It's currently known from over 100 collections from 22 sites in California, and 13 additional locations in the Pacific Northwest. Only 11 collections (from five locations) have been made in California in the past 25 years. *R. mustelina* may be more common than reported.

TAXONOMIC NOTES: *Russula mustelina* is a European species, which also has been confirmed from western North America; data is still lacking from eastern North America.

DISTRIBUTION: Known from 22 locations in California, 3 in Oregon, 8 in Washington, and 2 in Idaho. This species occurs in dry, mostly high-elevation and

eastern-slope true fir forests in the Sierra Nevada, north at least into the Washington Cascades and northern Rocky Mountains in Idaho. **USA: CA: Trinity Co.**, KNF, Gray Falls Campground. **Siskiyou Co.**, S-TNF, Mt. Shasta, Sand Flat. S-TNF, Trout Creek. S-TNF, near Harris Spring. S-TNF, near Little Glass Mountain. S-TNF, Carter Meadows, near Callahan. **Sierra Co.**, TNF, near San Francisco State University Sierra Nevada Field Campus. TNF, Yuba Pass. TNF, Wild Plum Campground. TNF, Chapman Creek Campground. TNF, Lincoln Creek Campground. **Nevada Co.**, TNF, Skillman Flat Campground. TNF, Donner Summit area. **El Dorado Co.**, ENF, Echo Summit. ENF, Ice House Reservoir. **Amador Co.**, ENF, Silver Lake. **Alpine Co.**, ENF, near Blue Lake. StaNF, Lake Alpine. **Madera Co.**, Devil's Postpile National Monument, Soda Creek. **Tuolumne Co.**, StaNF, Pinecrest. YNP, Tuolumne Meadows. **Fresno Co.**, SieNF, Huntington Lake. **OR:** 3 sites. **WA:** 8 sites. **ID:** 2 sites.

DESCRIPTION: CAP 7–12 (15) cm across, convex to broadly convex at first, becoming plane, disc often depressed in age. Surface smooth, dull, dry to thinly viscid if wet. Color highly variable; typically pale, cream, yellowish to pinkish when young, developing pink to vinaceous areas, becoming mottled pink, red and vinaceous red with paler cream or yellowish patches, to all vinaceous to red-brown in age. **GILLS** broadly attached, close to subdistant, broad, fragile. White when young, becoming creamy in age. **STIPE** 4–9 cm long, 1.5–3 cm thick, equal, or enlarged slightly towards base. White, at times staining brownish when handled. **FLESH** thick, very firm, stipe solid, white, at times staining brownish in stipe. **ODOR** indistinct. **TASTE** mild. **SPORE DEPOSIT** pale yellow. **MICROSCOPY:** Spores 7.5–10.5 x 6.5–9 µm, subglobose to subovoid, amyloid, ornamented with isolated warts, 0.5 µm long, with connecting lines and heavy ridges, forming a partial to complete network. **Cap cuticle** two layered; upper layer a tangled to interwoven layer of hyphae; subcutis of interwoven gelatinous hyphae.

ECOLOGY: Solitary or scattered in duff or soil, at times buried under duff well into maturity. Ectomycorrhizal; typically found under Red Fir (*Abies magnifica*) and White Fir (*Abies concolor*). Most collections come from drier, high-elevation forest. Fruiting in summer and fall, rarely in late spring.

SIMILAR SPECIES: Members of the *Russula xerampelina* group have similarly variable colored caps, but often have a rosy blush to the stipe, yellow to brown staining, and a softer, pith-like core in the stipe. A number of other *Russula* species are similar, but differ in one or more of the described features of *R. mustelina*.

Photo: US Forest Service/Christian Schwarz.

Stagnicola perplexa

(P.D. Orton) Redhead & A.H. Sm.

COMMON NAME:

SPECIES CODE: STPE11



FAMILY: Mythicomycetaceae

SYNONYMS: *Phaeocollybia perplexa* P.D. Orton, *Naucoria cidaris* var. *minor* (Fr.) Sacc., *Panaeolus sphinctrinus* var. *minor* (Fr.) Singer., *Agaricus campanulatus* c *minor* Fr.

SUMMARY: A small brown mushroom with an umbonate, brownish to yellow-brown cap, olivaceous gray to cinnamon gills, a fibrous stipe with a reddish brown to black base and a pale apex. The bitter taste, smooth spores (tan-brown to hazel colored in deposit), and cylindrical cystidia help distinguish this species. Typically found in moist depressions, often on rotten, saturated wood. Known from a single site in California, near Mount Shasta, and 17 sites in the Pacific Northwest, and northern Rocky Mountains.

TAXONOMIC NOTES: *Stagnicola* forms a close-knit group with *Mythicomycetes*, in a sister family to Psathyrellaceae.

DISTRIBUTION: Scattered in mid- to high- elevation forests in the Cascades. Known from a single site in California, two in Oregon, five in Washington, three in Idaho, and seven sites in British Columbia. Also reported from Michigan, Ontario, Canada and Europe. **USA: CA:** Siskiyou Co., S-TNF, Mt. Shasta, Cold Creek. **OR:** 2 sites.

WA: 5 sites. **ID:** 3 sites. **CANADA:** **BC:** 7 sites.

DESCRIPTION: **CAP** 0.4–2.5 cm across, conic at first, becoming bell-shaped to convex with a prominent, blunt umbo, margin incurved when young, often flaring in age. Surface smooth, moist to lubricous; margin translucent-striate when wet, dull when dry. Brown over disc, paler orange-brown to yellow-brown towards margin; becoming more yellowish orange to yellowish overall in age. **GILLS** narrowly attached, at times seceding, close, narrow. Pale olivaceous gray when young, developing golden tones, to cinnamon-gray to cinnamon when mature. **STIPE** 1.5–5 cm long, 0.1–0.2 cm thick, equal or tapering towards a curved base. Surface smooth, moist to dry; base with ochre mycelium. Yellow-brown to ochre at apex, transitioning to a reddish brown to blackish base. **FLESH** very thin, fragile in cap, stipe fibrous, concolorous with surface. **ODOR** indistinct. **TASTE** mildly to strongly bitter. **SPORE DEPOSIT** tan-brown to hazel. **MICROSCOPY:** **Spores** 5–6.4 x 3–3.8 (4.5) μm , ellipsoid to nearly kidney-shaped, smooth, lacking a germ pore, nearly colorless to pale yellow in KOH, inamyloid. **Basidia** 15–21 x 4.8–5.2 μm , clavate, 4-spored. **Cheilocystidia** abundant; not always forming a sterile margin, 25–54 x 5–7 μm , cylindric to narrowly fusoid, occasionally forked or single septate, thin-walled. **Pleurocystidia** lacking or present only near gill edge; similar to cheilocystidia. **Cap cuticle** a thin, gelatinized ixocutis of radially arranged, filamentous hyphae 2.5–4.5 μm across. **Clamp connections** present.

ECOLOGY: Saprobic. Solitary or scattered on rotten, often saturated wood, duff or on decayed plant debris; fruiting in the fall. Typically, in moist depressions, dried pools, or other seasonally flooded areas. Also around springs and seeps (similar to the habitat in which many *Botrychium* ferns are found in California). Most sites in western North American are in old-growth forest.

SIMILAR SPECIES: *Mythicomyces corneipes* looks very similar and shares the same habitat. Typically, it lacks the distinct umbonate cap, tends to be slightly more orange in color, has a pale purple-brown spore deposit, and has a mild to slightly bitter taste. Microscopically, the spores are ornamented with scattered short ridges and projections, and the gills have scattered large cystidia with amyloid encrustations. *Rhodophana nitellina* has a convex to plane cap (never umbonate), typically brighter orange colors, a strong cucumber-farinaceous odor, and pinkish, teardrop-shaped, roughened spores. Many *Galerina* species are somewhat similar, but all have rusty brown spores, and are typically more translucent, paler in color, and often more delicate. *Phaeocollybia attenuata* can look similar, but has a more evenly dark, wire-like stipe with a rooting base, reddish brown spore deposit, and roughened, lemon-shaped spores.

Photo: US Forest Service/Christian Schwarz.

Stropharia hornemannii

(Fr.) S. Lundell & Nannf.

COMMON NAME:

SPECIES CODE:



FAMILY: Strophariaceae

SYNONYMS: *Agaricus hornemannii* Fr., *Agaricus hornemannii* var. *depilatus* Fr., *Naematoloma hornemannii* (Fr.) Singer, *Psilocybe hornemannii* (Fr.) Noordel., *Agaricus depilatus* Pers., *Fungus depilatus* (Pers.) Kuntze, *Geophila depilata* (Pers.) Kühner & Romagn., *Stropharia depilata* (Pers.) Sacc., *Stropharia depilata* var. *microspora* Pilát

SUMMARY: Recognized by its large size, chestnut brown cap (soon fading to brownish buff), cool gray gills darken as spores mature, shaggy white stipe with a skirt-like ring, and dark purple-brown spores. Locally common in the Pacific Northwest, and Rocky Mountains; rare in California.

TAXONOMIC NOTES: Described from Europe as *Agaricus hornemannii* (Fries, 1818), later transferred to *Stropharia* by Lundell & Nannfeldt (1934). DNA sequences of western North American collections should be compared against those of eastern North American and European collections; there may be distinct taxa involved.

DISTRIBUTION: Widespread and locally common in North America; rare in California. Occurring in the Pacific states, Rocky Mountains, eastern North America,

from North Carolina into Canada, in northern Europe (and likely across Russia). In California, it occurs on the North Coast, in the Klamath and Cascade ranges, and in the northern Sierra Nevada. In 35 years of Humboldt Bay Mycological Society Fairs, it has been recorded only five times. In RNP, it has only been recorded four times in 40 years of surveys. **USA: CA: Humboldt Co.**, RNP, near Orick (photo only). **Siskiyou Co.**, S-TNF, Raccoon Creek (photo only). **Sierra Co.**, TNF, Packer Lake. **OR:** 22 sites. **WA:** 40 + sites. **CANADA: BC:** 10+ known sites.

DESCRIPTION: **CAP** 4–12 (15) cm across, rounded-conical at first, becoming convex to plane with a broad umbo, margin incurved and often adorned with whitish veil specks when young, often uplifted and wavy in age. Surface viscid to lubricous, with veil remnants on margin when young, soon smooth. Color variable, usually lilac-brown to reddish brown at first, fading to grayish brown or smoky buff in age. Collections found in dry conditions are often considerably paler. **GILLS** broadly attached, often with a decurrent tooth, close, broad, partial gills numerous. Pallid at first, soon gray to vinaceous gray, becoming deep vinaceous gray to blackish when spores mature. **STIPE** 6–11 (15) cm long, 0.5–2 cm thick, equal or club shaped with an enlarged base. Surface dry, covered with white flocculent scales below veil, pruinose above; often cracking concentrically in dry conditions. Whitish to buff at first, darkening slightly in age. **PARTIAL VEIL** thick, membranous, forming a flaring skirt-like ring high on stipe, collapsing in age. **FLESH** thick, soft, whitish to buff, discoloring ochre-brown around larva tunnels and in age. **ODOR** mild to unpleasant. **TASTE** disagreeable. **SPORE DEPOSIT** dark purple-brown to purplish black. **MICROSCOPY:** **Spores** 11–13 x 6–6.5 μm , ellipsoid to amygdaliform, with a broad germ pore, smooth, thick-walled, grayish brown in KOH. **Basidia** 28–32 x 9–11 μm , 4-spored. **Pleurocystidia** 40–60 x 10–20 μm , lageniform, with a swollen base and slender neck, with yellow content in KOH. **Cheilocystidia** 30–50 x 5–15 μm , narrowly clavate. **Clamp connections** present.

ECOLOGY: Saprobic, usually found on or near well-rotted conifer wood, stumps, and twig-rich duff in coastal and montane forests. Fruiting singly or in small clusters from early fall into early winter.

SIMILAR SPECIES: *Stropharia ambigua* has a thinly viscid to slimy, yellow-buff, ochre-yellow to butterscotch-colored cap, large triangles of fluffy white veil tissue hanging from the margin of the cap when young, and a tall, scaly to nearly smooth white stipe. Besides its paler colors, it lacks the skirt-like ring, and its stipe is typically less scaly than in *S. hornemannii*.

Stropharia kauffmanii

A.H. Sm.

COMMON NAME:

SPECIES CODE:



FAMILY: Strophariaceae

SYNONYMS: None

SUMMARY: The dry, scaly, buff to honey brown cap, lilac-gray to brown gills, dark purple-brown spores, and often disagreeable odor are distinctive. Widespread in North America, but generally rare. Known from 11 California locations (very few are recent collections), 5 in Oregon and 9 in Washington.

TAXONOMIC NOTES: Described by Smith (1941) from Olympic National Park, Washington. DNA sequences of western North American collections should be compared with those of eastern North American collections; they may represent a distinct species.

DISTRIBUTION: Widespread in North America, but rare. Known from 11 California locations, 5 in Oregon and 9 in Washington (including the type specimen from Clearwater River, in Olympic National Park). Also found in the Rocky Mountains, from Arizona into Alberta, Canada, and from North Carolina, Indiana, Michigan, and Quebec in eastern North America. **USA: CA: Trinity Co.,** Location unknown, presumed to be S-TNF, along Trinity River. **Mendocino Co.,** Navarro River.

Marin Co., 2.25 miles west of Lagunitas Post Office. **Contra Costa Co.**, New Regional Redwood Park, Gardner Canyon. **Sierra Co.**, TNF, Yuba Pass. San Francisco State University Sierra Nevada Field Campus near Yuba Pass. **Amador Co.**, ENF, Carson Spur. **El Dorado Co.**, ENF, Cold Creek. ENF, Carson Pass. **Alpine Co.**, StaNF, Lake Alpine. **Calaveras Co.**, Location unknown. **Tuolumne Co.**, StaNF, Pinecrest. **OR:** 5 sites. **WA:** 9 sites. **CANADA: BC:** 3 sites.

DESCRIPTION: **CAP** 4–10 (15) cm across, convex to broadly convex, occasionally expanding to plane; margin incurved at first, becoming plane or uplifted in age. Surface dry, covered with recurved scales becoming more matted-fibrillose in age; margin often with whitish veil remnants. Buff to honey brown, covered with slightly darker brown or yellow-brown scales. **GILLS** narrowly attached, often seceding, close to crowded, narrow, partial gills numerous. Gray to lilac-gray, becoming deep brown as spores mature. **STIPE** 5–10 cm long, 1–3 cm thick, more or less equal. Surface dry, covered with recurved scales below veil. Base often with white rhizomorphs. White to pale buff, at lower portion often with pale orange scales, and discoloring orangish in age. **PARTIAL VEIL** membranous, adhering to cap margin and forming a short skirt- to collar-like ring on stipe, collapsing or disappearing in age. **FLESH** thick, soft, whitish. **ODOR** mild to unpleasant, rancid. **TASTE** slightly disagreeable. **SPORE DEPOSIT** dark purple-brown. **MICROSCOPY:** **Spores** 6–8 x 4–5 μm , ellipsoid, smooth, thick-walled, grayish brown in KOH. **Cheilocystidia** 20–40 x 5–15 μm , nearly cylindrical to spindle shaped, smooth, with yellow contents in KOH.

ECOLOGY: Solitary or scattered in leaf litter of deciduous trees; especially alder, cottonwood and maple, typically in riparian habitats. More rarely in conifer duff or around well-rotted woody debris. Saprobiic on leaf litter and duff. Fruiting in spring and fall.

SIMILAR SPECIES: *Agaricus augustus* has a similarly colored and textured cap, but becomes more amber-colored in age, has distinctly free gills at all stages, a strong almond odor, and dark chocolate brown spores.

Tricholoma apium

Jul. Schaff.

COMMON NAME:

SPECIES CODE:



FAMILY: Tricholomataceae

SYNONYMS: *Tricholoma helviodor* Pilát & Svrček, *Tricholoma vaccinooides* Pilát

SUMMARY: Recognized by its dry, often areolate, whitish to ochre-buff cap which develops ochre brownish to olive brownish tones in age, narrowly attached gills, a whitish stipe with ochre-brown scales and white mycelium at the base of the stipe. The odor is reminiscent of celery, although it is faint in most of the western collections. This species appears to be restricted to mature and old-growth forests. Most western locations are coastal; in California, it is known from four sites (two voucher-confirmed). It was not reported by Kris Shanks (1997) in her monograph of California *Tricholoma*. It is an IUCN Red-Listed species, mostly based on its rarity and decline of suitable habitat in Europe.

TAXONOMIC NOTES: DNA sequences of western North American *Tricholoma* collections should be compared with those of European and eastern North American collections; multiple species with different biogeographies may be involved. Being relatively nondescript, this species may be overlooked or passed off as an old *Leucopaxillus gentianeus*.

DISTRIBUTION: Known from 28 collections from 14 voucher-confirmed locations in western North America; four of these (two voucher-confirmed) are from California. Most collections come from the area around Roberts Creek, British Columbia, Canada. Occurring primarily in coastal forests from Sonoma County, California, north into central British Columbia, Canada. Known from one site in Massachusetts and two in Newfoundland, Canada. Also found in Europe, where it is Red-Listed in most of the countries in which it occurs. **USA: CA: Humboldt Co.,** RNP (photo only). **Siskiyou Co.,** KNF (unconfirmed). **Mendocino Co.,** Jackson State Forest. **Sonoma Co.,** Salt Point State Park. **OR:** 1 site. **WA:** 2 sites. **CANADA: BC:** 7 sites.

DESCRIPTION: **CAP** 4–10 cm across, convex to broadly umbonate with an inrolled margin when young, becoming broadly convex to plane, margin wavy and often uplifted in age. Surface dry, dull, finely tomentose to slightly flocculent, becoming areolate in patches with age. Whitish to ochre-buff when young, often patchy, ochre brownish to olive brownish with age. **GILLS** narrowly attached, often with a broad notch, close to crowded, narrow, ragged in age. White to creamy white, with yellowish stains in age. **STIPE** 3–8 cm long, 1–2 cm thick, equal or narrowing towards base. Surface dry, fibrillose-scaly, base with white mycelium. Whitish to cream-colored, scales ochre-brownish, darkening overall with age. **FLESH** thin to moderately thick, firm, fragile in cap, fibrous in stipe, white to cream-colored. **ODOR** pleasant, faint to strong, reminiscent of fennel or celery. **TASTE** mild to slightly farinaceous. **SPORE DEPOSIT** white. **MICROSCOPY: Spores** 4–6 x 4–5 μm , ovoid to nearly round, smooth, hyaline, inamyloid. **Basidia** 22–33 x 5–6.5 μm , narrowly clavate. **Pleurocystidia** and **cheilocystidia** absent. **Cap cuticle** of irregular to slightly parallel hyphae 4–12 μm across, occasionally brown-pigmented. **Clamp connections** absent.

ECOLOGY: Ectomycorrhizal. Fruiting from soil and duff of mature and old-growth forests, fruiting in fall and winter. The mycorrhizal host in western North America is still unknown; it may form symbioses with multiple tree species. One of the Washington sites is dominated by Western Hemlock (*Tsuga heterophylla*), while the forest of the Oregon site is composed of mixed Western Hemlock, Sitka Spruce (*Picea sitchensis*) and Douglas-fir (*Pseudotsuga menziesii*). Two of the California sites are in mixed hemlock/Douglas-fir forest with a significant component of Tanoak (*Notholithocarpus densiflorus*). The third location lacks hemlock, but Grand Fir, (*Abies grandis*), Douglas-fir and Tanoak are present. In Europe, this species is mycorrhizal with Scots Pine (*Pinus sylvestris*), typically in areas of sandy soil. One of the eastern North American sites is an area with sandy soil, associated with Pitch Pine (*Pinus rigida*).

SIMILAR SPECIES: *Tricholoma manzanitae* has a creamy white cap when young, soon becoming creamy buff to pinkish buff, and eventually orangish brown to buff-brown in age. Its cap surface is smooth or with small appressed scales or matted fibrils, and is distinctly viscid to sticky when wet. It is mycorrhizal with Pacific Madrone (*Arbutus menziesii*) and manzanita (*Arctostaphylos* spp.). *Leucopaxillus albissimus* is typically larger, has a chalky white cap, which yellows slightly in age, broadly attached to decurrent gills and has spores with amyloid warts. *Leucopaxillus gentianeus* has a brown, ochre-brown to tan cap, broadly attached to slightly decurrent gills, and a bitter taste; it has amyloid-warted spores.

Tricholoma dulciolens

Kytöv.

COMMON NAME: Booted Trich

SPECIES CODE:



FAMILY: Tricholomataceae

SYNONYMS: *Tricholoma caligatum* var. *dulciolens* (Kytöv.) Bon, *Armillaria caligata* var. *occidentalis* A.H. Sm.

SUMMARY: A medium-sized mushroom recognized by its dark brown fibrils or floccules over a creamy white to buff cap, tall cylindrical stipe with a membranous partial veil, strong, spicy-cinnamon or musty odor, and bitter taste. Rare in California; known from coastal forests and the Sierra Nevada foothills.

TAXONOMIC NOTES: Long referred to *Tricholoma caligatum*, it has recently been confirmed that the California species going by this name is appropriately called *Tricholoma dulciolens*.

DISTRIBUTION: Rather rare in the Pacific states; occurring in the Sierra Nevada foothills and coastal forests in California, from the Coast Range to the Cascades in the Pacific Northwest. More widespread, and likely more common in British Columbia, (currently known from nine locations). Also known from eastern North America and Europe. **USA:** **CA:** Colusa Co., MeNF, Trough Spring Ridge. Yuba Co., TNF, Bullard's Bar Rec. Area. Tuolumne Co., StaNF, Pinecrest. **OR:** 2 sites.

WA: 5 sites. **ID:** 3 sites. **CANADA:** **BC:** 9 sites.

DESCRIPTION: **CAP** 4–9 cm across, rounded to convex at first, becoming broadly convex to plane, or with a low umbo. Margin inrolled at first, then uplifted in age. Surface dry, covered with radially arranged appressed to slightly recurved, dark brown to blackish fibrils or floccules over a creamy white to buff base color. **GILLS** attached, notched, close to crowded, narrow. White, developing orangish brown spots and stains in age. **STIPE** 7–12 (18) cm long 1–2.5 cm thick, tall and cylindrical, equal or tapering towards an often-rounded base. Surface dry, with belts or scattered patches of appressed to floccose, dark brown squamules over a creamy white to pale tan background below the veil, whitish to cream with faint belts of recurved fibrils above the veil. **PARTIAL VEIL** forming a membranous ring which is often flared upwards when young, then hanging in age. Whitish to pale brown. **FLESH** very firm, somewhat rubbery, stipe solid and fibrous. White, unchanging. **ODOR** cinnamon-spicy, with musty undertones. **TASTE** bitter, sometimes extremely so. **SPORE DEPOSIT** white. **MICROSCOPY:** **Spores** 5.3–7.2 x 4.3–6.2 μm , broadly ellipsoid to subglobose, smooth, hyaline, inamyloid. **Basidia** 28–32 x 6.2–7.2 μm , cylindric to subclavate, 4-spored. **Pleurocystidia** and **cheilocystidia** absent. **Caulocystidia** present at stipe apex, 26–48 x 3.8–4.8 μm , cylindric. **Cap cuticle** a cutis, hyphae hyaline, or with refractive golden to yellow-brown contents, 4–14 μm across. **Clamp connections** absent.

ECOLOGY: Ectomycorrhizal. Solitary or scattered in mixed forests dominated by Douglas-fir (*Pseudotsuga menziesii*) and Tanoak (*Notholithocarpus densiflorus*) in California. Sites in Oregon and Washington are dominated by Western Hemlock, (*Tsuga heterophylla*), Douglas-fir (*Pseudotsuga menziesii*), and fir (*Abies* spp). Elsewhere in North America, it has been found with spruce (*Picea* spp.). Fruiting in fall and winter.

SIMILAR SPECIES: *Tricholoma murrillianum* (better known as *T. magnivelare*, which is properly an eastern and north-central North American species) has a whitish cap, crowded creamy white gills, a thick, creamy white cottony veil, and the same distinctive cinnamon odor. Although it can exhibit orangish to orange-brown scales and floccules, they are more warmly colored, and rarely as dark as in *T. dulciolens*. Additionally, *T. murrillianum* lacks the bitter taste of *T. dulciolens*, and tends to be shorter and stouter in stature. The often massive *Catathelasma ventricosum* has a whitish to gray cap with dark appressed squamules, deeply decurrent gills, a thick partial veil, and a strongly farinaceous odor and taste.

Photo: © Alissa Allen.

Tricholoma mutabile

Shanks

COMMON NAME:

SPECIES CODE:



FAMILY: Tricholomataceae

SYNONYMS: None

SUMMARY: *Tricholoma mutabile* can be recognized by its viscid, dark (sometimes pale) gray cap with a broad pale margin, white gills and stipe, and strong farinaceous odor and taste. Microscopically, the inflated terminal cells of the cap cuticle and broadly ellipsoid to subglobose spores help distinguish this species. Known in California from five voucher-confirmed sites, (plus two other sites from photographs only) in coastal forests and the Sierra Nevada foothills.

TAXONOMIC NOTES: Described by Shanks (1996) this species would previously likely have been mistaken for one of a number of similar *Tricholoma* species. A.H. Smith used the name *Tricholoma portentosum* var. *avellaneifolium* for his collections from Olympic National Park (associated with conifers); the DNA sequences of these collections should be compared with those of hardwood associated collections from California.

DISTRIBUTION: Occurring in the Sierra Nevada foothills and coastal forests in California, and the Olympic Mountains in Washington. **USA:** CA: Humboldt Co.,

Tish Tang Campground. **Siskiyou Co.**, KNF, near Happy Camp (unconfirmed). **Sonoma Co.**, Salt Point State Park. **Marin Co.**, Audubon County Ranch. **Yuba Co.**, TNF, Bullard's Bar Rec. Area, Schoolhouse Campground (Type). **Nevada Co.**, Nevada City (photo only). **WA**: 1 site.

DESCRIPTION: **CAP** 3–9 cm across, obtuse-conic to convex, becoming broadly convex, with a broad or prominent umbo; margin downturned when young, soon wavy, and often becoming uplifted in age. Surface viscid to tacky, smooth, often radially rugulose. Dark gray, gray-brown, pale gray to pale violet-gray on the disk, progressively paler and whitish towards margin, with irregular darker gray streaks, darkening slightly in age, at times developing yellowish stains. **GILLS** attached, notched, close, narrow, often ragged in age. White, at times with pale golden brown stains in age. **STIPE** 5–12 cm long, 0.9–2.5 cm thick, equal or enlarged slightly towards base. Surface dry, silky fibrillose, often with whitish chevrons near apex when young, otherwise nearly smooth. White, discoloring pale golden brown with age. **FLESH** thin, fragile in cap, white to grayish. Stipe solid to hollow, fibrous. White to watery gray, base dull pink or pale orange. **ODOR** pungent, sweet-farinaceous. **TASTE** strongly sweet-farinaceous. **SPORE DEPOSIT** white. **MICROSCOPY:** **Spores** 5.8–7.7 x 4.3–5.8 μm , broadly ellipsoid to subglobose, hyaline, smooth, inamyloid. **Basidia** 33–40 x 7.2–9.6 μm , clavate, 4-spored. **Cheilocystidia** 26–43 x 8.2–12 μm , cylindric, clavate, to broadly clavate, hyaline, thin-walled to slightly thick-walled. **Pleurocystidia** absent. **Caulocystidia** 29–34 x 4.8–7.2 μm , occurring in tufts and clusters on stipe apex, cylindric to clavate, often flexuous, hyaline or with hyaline granular contents, thin-walled to slightly thick-walled. **Cap cuticle** an irregularly entangled layer of hyphae with the terminal 5–6 cells inflated, up to 25 μm across. **Clamp connections** absent.

ECOLOGY: Ectomycorrhizal. Fruiting solitary or scattered in mixed Tanoak-conifer forests, California collections appear to be ectomycorrhizal with Tanoak (*Notholithocarpus densiflorus*); however, the Washington collections came from mixed conifer forest with *Abies*, *Tsuga* and *Pseudotsuga*, (lacking Tanoak). Fruiting in fall and winter.

SIMILAR SPECIES: *Tricholoma griseoviolaceum* has a violet-gray, viscid cap, white gills and stipe, a farinaceous odor and taste, and grows under live oaks. Besides the cap exhibiting more violet tones and its habitat under live oaks, not much separates it from *T. mutabile* macroscopically. Microscopically, the cap cuticle of *T. griseoviolaceum* is an ixocutis, with loosely interwoven hyphae 2–10 μm across embedded in a gelatinous matrix, and ellipsoid spores, 4.8–7.2 x 3.4–4.8 μm . *Tricholoma nigrum* has a dry to tacky, darker slate-gray to gray cap, with a paler

margin and black radial streaks. It may also have a darker concentric band, giving it a two-toned appearance. The white stipe typically has (or develops) blackish fine scales near the apex; especially with age. It's uncommon in California, most records are from the far North Coast. *Tricholoma virgatum* has a dry to moist, dark gray to gray or brownish gray with black or dark gray streaks or appressed fibers. It typically has a distinctly conical cap when young, becoming convex to plane, but with a well-defined umbo at all stages. This, along with a slowly, strongly acrid taste helps distinguish it. *Tricholoma portentosum* has a dark gray to grayish brown viscid cap, with darker streaks, and gills that develop distinct yellow tones as they age.

Tricholoma venenatum

G.F. Atk.

COMMON NAME:

SPECIES CODE: TRVE8



FAMILY: Tricholomataceae

SYNONYMS: None

SUMMARY: A medium to large mushroom with a whitish to tan cap with brown scales near the center, white to creamy gills, a white stipe and white spores. It is fairly non-descript, most likely to be confused with the similar *Tricholoma pardinum*. Rare; known from 15 collections in western North America, and only eight locations in California, from the Sierra Nevada and Cascade Range.

TAXONOMIC NOTES: *Tricholoma venenatum* was described from a collection made in a hardwood forest in Michigan (Atkinson 1908). Ovrebo & Hughes (2018) described *Tricholoma smithii*, a *T. venenatum*-like species from the Rocky Mountains; it likely also pertains to the California species we are calling *T. venenatum*. Further investigation is needed.

DISTRIBUTION: Known from 15 collections from western North America; all from conifer forests in the Sierra Nevada, Cascade Range, Olympic Mountains, and Rocky Mountains. An additional 20 locations are known from hardwood forest in eastern North America. **USA:** CA: Shasta Co., LNF, near Viola. Sierra Co.,

TNF Yuba Pass. TNF, Chapman Creek Campground. TNF, Turner Canyon, Highway 49. TNF, San Francisco State University Field Campus. **Placer Co.**, south of Tahoe City. **Tuolumne Co.**, StaNF, Pinecrest. Bottin Ranch Road near Highway 108. **OR:** 1 site. (reported to be additional Survey & Manage collections). **WA:** 2 sites. **CO:** 3 sites. **NM:** 1 site.

DESCRIPTION: **CAP** 7–13 cm across, convex at first, soon broadly convex to plane, margin occasionally wavy and uplifted in age. Surface dry, appressed-fibrillose, often with tufts or recurved scales over disc. White to pale tan, scales usually pale brown. **GILLS** narrowly attached with a distinct notch, close to crowded, thin. White to pale cream. **STIPE** 4–10 cm long, 1.5–2.5 cm thick, equal to club-shaped, often with a slightly bulbous base. Surface dry, silky fibrillose. White, with tan stains or discolorations when handled. **FLESH** thick, firm, fibrous. White, or with grayish tones near cap surface. **ODOR** indistinct to slightly farinaceous. **TASTE** mild to farinaceous. **MICROSCOPY:** **Spores** 7.2–10.7 x 4.8–7.2 μm , ellipsoid, smooth, hyaline, inamyloid. **Basidia** 40–48 x 7.2–9.2 μm , clavate, 4-spored. **Pleurocystidia** and **cheilocystidia** absent. **Caulocystidia** 24–43 x 3.4–3.8 μm , present as recurved hyphal tips, cylindric, in large interwoven clusters, smooth, hyaline or pale yellow. **Cap cuticle** a cutis, hyphae 2.4–9.6 μm across, hyaline or pale brown, smooth, or with fine, hyaline, granular encrustations. **Clamp connections** present.

ECOLOGY: Solitary or scattered in soil and duff under conifers, in higher elevation forests (over 1280 m in California). Rarely collected in western North America; specific identities of mycorrhizal hosts unknown. Fruiting in fall.

SIMILAR SPECIES: *Tricholoma pardinum* has a dry, whitish to gray cap with gray to blackish scales, white gills and stipe, and large, stocky stature. More rarely, young or wet specimens sometimes lack the gray color and can be whitish and without the gray scales. However, it doesn't exhibit the tan to brown colors *T. venenatum* does, and microscopically can be distinguished by the presence of cheilocystidia (although it can be hard to demonstrate their presence).

Photo: © Steve Trudell.

Tricholomopsis fulvescens

A.H. Sm.

COMMON NAME:

SPECIES CODE: TRFU3

FAMILY: Tricholomataceae

SYNONYMS: None

SUMMARY: *Tricholomopsis fulvescens* is a small, slender mushroom with an orange-yellow cap covered in appressed tawny fibrils, yellow gills, and a yellow-brown stem which darkens to rusty brown where handled. Microscopically, it has large, broadly ellipsoid spores, relatively small clavate cheilocystidia, abundant pleurocystidia, and a cap cuticle with thick-walled yellow hyphae (in KOH). A rare and poorly known species. Since it was described from few collections, some unreported morphological variation from the original description may be expected.

TAXONOMIC NOTES: Described by Smith (1960) from Mount Rainier National Park, in Washington. Western North American *Tricholomopsis* species are poorly known, and need further study.

DISTRIBUTION: Very rare; scattered in the Cascades of Washington and Oregon, with a single site in the Klamath Range in California. Also reported from Arizona; these collections should be verified. **USA: CA: Siskiyou Co.**, KNF, Stanishaw trail. **OR:** 1 site. **WA:** 5 sites. Mount Rainier National Park, Lower Tahoma Creek (Type). **AZ:** 5 sites.

DESCRIPTION: **CAP** 3–5 cm across, obtusely convex at first, becoming broadly convex; margin inrolled when young, downcurved to plane when mature. Surface dry, appressed-fibrillose over disc, fibrils becoming arranged in appressed tufts or clusters near margin. Orange-yellow, yellow-ochre to yellowish tan, with tawny fibrils. **GILLS** broadly attached, close to subdistant, broad. Pale yellow. **STIPE** 6–9 cm long, 0.8–1 cm thick, narrowly club-shaped. Surface dry, silky at apex, appressed-fibrillose lower; base with yellow mycelium. Yellow-brown over lower portion, paler toward apex, staining rusty brown when handled. **PARTIAL VEIL** (likely sparse) leaving yellowish remnants on stem or totally inconspicuous and not apparent. **FLESH** thin, whitish to buff, darkening when cut. Stipe hollow, watery ochraceous, darkening with age, and when cut. **ODOR** indistinct. **TASTE** indistinct. **SPORE DEPOSIT** white. **MICROSCOPY:** **Spores** 8–10 x 6–7 μm , broadly ellipsoid, smooth, inamyloid. **Basidia** 38–53 x 6–7 μm , 4-spored. **Pleurocystidia** abundant, 50–80 x 6–9 (11) μm , subfusoid to subcylindric or somewhat contorted, not

projecting prominently, content oily. **Cheilocystidia** abundant, 28–40 x 6–9 μm , clavate to somewhat fusoid-ventricose. **Cap cuticle** a layer or lattice of tangled, yellow (in KOH), thick-walled hyphae, 3–8 μm across.

ECOLOGY: Saprobic. Solitary or scattered on rotten conifer wood in mid- to high-elevation forests. A poorly known species with limited knowledge of habitat preference. Fruiting in fall.

SIMILAR SPECIES: *Tricholomopsis bella* has a slightly differently colored cap: dull ochraceous, with a fibrillose-scaly to squamulose texture, but is otherwise very similar macroscopically. Microscopically, it has smaller spores (6–7 x 5–5.5 μm) and shorter pleurocystidia, (30–40 x 6–9 μm) which lack oily contents. *Tricholomopsis flavissima* is a slender, bright yellow species that does not discolor rusty brown when handled; microscopically, it has globose to subglobose spores, and long, filamentous cheilocystidia (40–200 x 3–5 μm). *Tricholomopsis decora* has a golden yellow cap with tiny brownish black scales, crowded yellow gills, and smaller spores.

Volvariella surrecta

(Knapp) Singer

COMMON NAME: Piggyback Pinkgill

SPECIES CODE:



FAMILY: Pluteaceae

SYNONYMS: *Agaricus surrectus* Knapp, *Volvaria surrecta* (Knapp) Ramsb., *Agaricus loveianus* Berk., *Volvariopsis loveiana* (Berk.) Murrill, *Volvaria loveiana* (Berk.) Gillet, *Volvaria hypopithys* ssp. *loveiana* (Berk.) Konrad & Maubl.

SUMMARY: A small mushroom with a silky white cap, whitish gills that are pinkish when mature, pinkish buff spores, a thin but membranous volva, and growth on deformed *Clitocybe* species. Very rare: Known from only 12 locations in North America, two of which are in Humboldt County, California.

TAXONOMIC NOTES: First described by Knapp (1829) based on a European type, subsequently transferred into *Volvariella* by Singer (1949). No molecular studies have been done comparing western and eastern North American collections with their European counterparts.

DISTRIBUTION: Widespread but rare. Known from 12 sites in North America. Two sites on the North Coast of California and a single site in Idaho are the only western North American records. Also reported from Europe, Africa, and New Zealand. **USA: CA: Humboldt Co.,** Eureka, Big Hill (photo only). Fieldbrook. **ID:**

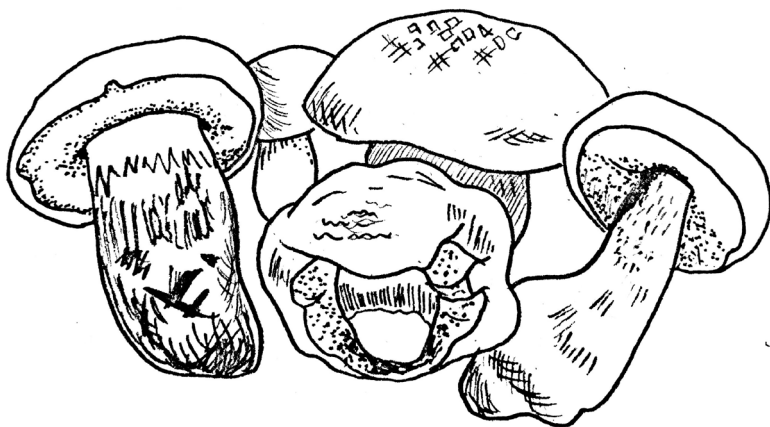
1 site. **MI:** 2 sites. **NY:** 1 site. **VT:** 1 site. **MA:** 2 sites. **CT:** 1 site. **CANADA:** **ON:** 1 site. **QC:** 1 site.

DESCRIPTION: CAP 2–5 cm across, round-conical to convex, expanding to broadly convex, margin often splitting in age. Surface dry, silky-fibrillose. White to pale grayish white, center developing pale yellowish brown colors. **GILLS** free, close to crowded. Whitish to pale pinkish at first, becoming pinkish buff. **STIPE** 3–8 cm long, 0.4–1 cm thick, equal or enlarged toward base; surface dry, silky-fibrillose, slightly scurfy at apex. White to pale grayish white. **VOLVA** a white, membranous, lobed cup at stipe base. **FLESH** thin, fragile, fibrous, whitish. **ODOR** indistinct. **TASTE** indistinct. **SPORE DEPOSIT** pinkish brown. **MICROSCOPY:** **Spores** 5.5–7.5 x 3.4–5 μm , ovoid, smooth. **Basidia** 17–31 x 5–10 μm , clavate; 4-spored. **Pleurocystidia** abundant, 21–57 x 8–38 μm , fusoid-ventricose, with an elongate neck, or enlarged at the apex, occasionally fusoid, clavate, or ovoid. **Cheilocystidia** abundant, 25–50 (70) x 6–20 (39) μm , fusoid-ventricose with a short, bulbous neck, occasionally fusoid, lanceoloid, clavate, or obovoid. **Clamp connections** absent.

ECOLOGY: Solitary or gregarious on the deformed fruit bodies of large *Clitocybe* species, especially *C. nebularis*. A mycoparasite, this species appears to attack the host mushrooms during early fruit body development (causing deformities), and then typically fruiting from the decaying, but recognizable remains.

SIMILAR SPECIES: No other *Volvariella* species grows on deformed mushrooms, but if the mushroom is collected without noting this distinctive substrate, correct identification may require microscopic examination. *Volvariella smithii* is a small, stocky species that typically grows in rich soil and humus. It has a whitish to pinkish buff cap and small spores (4.5–7 x 3–4 μm). *Volvariella hypopithys* has a small, whitish cap, but is taller and slenderer, with larger spores (6–10 x 3.5–6 μm). *Volvariella taylori* is a grass-dwelling species with a dark gray to pale grayish cap, and a dark grayish to brown volva. *Volvariella bombycina* is a much larger, wood-dwelling species (often on live trees), with a large, sheathing, sac-like volva, and a silky white cap. *Asterophora parasitica* is much smaller; it typically grows in clusters on old, decaying russulas, has a silky grayish to whitish cap, thick, widely spaced gills, whitish spores, and lacks a volva.

BOLETES



Boletus coccyginus

Thiers

COMMON NAME:

SPECIES CODE:



FAMILY: Boletaceae

SYNONYMS: None

SUMMARY: A small to medium-sized bolete with an evenly rosy red to pink cap, yellow pores, and flesh that typically doesn't stain blue. Known from 13 locations in total; 5 of these are in California.

TAXONOMIC NOTES: Preliminary DNA data suggest that *Boletus coccyginus* belongs in the genus *Hortiboletus*. Recent collections made under cottonwood (*Populus trichocarpa*) in the Pacific Northwest should be compared with California collections.

DISTRIBUTION: Known from 13 locations from both coastal and montane forests from central California north into Washington and Idaho. **USA:** **CA:** Calaveras Co., StaNF, Big Meadow Campground (Type). **Sierra Co.,** TNF, Wild Plum Campground. **Santa Cruz Co.,** Aptos, Hidden Oaks Lane. **San Mateo Co.,** Unknown (Orr 860). **San Francisco Co.,** Unknown (Orr 919). **OR:** 5 sites. **WA:** 2 sites. **ID:** 1 site.

DESCRIPTION: CAP 2–6 (8) cm across, rounded-convex to broadly convex when young, to nearly plane or irregular or wavy in age. Surface dry to moist, pubescent

when young, becoming smooth, often cracking in age. Rosy red, red, pinkish red to pinkish, often cracking and showing yellow flesh in age. **TUBES** sunken around stipe and rather short at margin. **PORES** small and irregular at first, expanding in age. Dull yellow at first, to yellow or greenish yellow, becoming slight olive-yellow in age, not staining blue on younger specimens, occasionally bruising bluish green in age. **STIPE** 1.5–7 cm long, 0.5–2 (3) cm thick, equal, peg-like; tapering toward base to irregular. Surface dry, often streaked with longitudinal striations to appressed-fibrillose, finely punctate at apex, to smooth. Pinkish red to pale reddish brown over a yellow base color. **FLESH** firm, moderately thick to thin, pale yellow or yellowish brown in stipe base, not staining when cut. **ODOR** indistinct. **TASTE** mild. **KOH** producing a dingy olive-green flash on cap, quickly becoming golden orange; dingy orange-brown on tubes, yellowish on stipe, no reaction on flesh. **SPORE DEPOSIT** olive-brown. **MICROSCOPY: Spores** 11–17.5 x 5–7 μm , cylindrical, ovoid to elliptical in face view; often somewhat variable in shape and size, smooth, moderately thick walled, ochre in KOH. **Basidia** 23–28 x 7–10 μm , club-shaped, 1- to 4-spored, hyaline. **Hymenial cystidia** absent. **Cap Cuticle** a tangled trichodermium of hyphae 5–7 μm wide, staining dark yellow in KOH. **Clamp connections** absent.

ECOLOGY: Solitary, scattered, or in small clusters on ground in mixed forests of Douglas-fir, Tanoak, and Coast Live Oak on the California coast, reported from under conifers in the mountains. Some of the Pacific Northwest collections were under cottonwood. Fruiting in fall.

SIMILAR SPECIES: *Xerocomellus dryophilus* typically has a cracked, burgundy-red to pinkish red cap, and has blue-staining pores and flesh. It is common in live oak woodland, from central California south. Sierra Nevada specimens of *X. atropurpureus* nom. prov. can have a reddish cap, although they tend to be more reddish purple to vinaceous black; it lacks the rosy red to pinkish colors of *B. coccyginus* and has a red punctate stipe. *Boletus smithii* is larger, has a rosy pink cap that fades irregularly to gray, with an intermediate yellow phase; yellow pores that become reddish blushed and occasionally stain blue, and a rosy pink stipe apex. *Butyribolletus* species are larger, have yellow pores that stain blue, and often large, club-shaped or swollen stipes. Specimens referred to *Boletus rubellus* from under introduced hardwoods in the Pacific Northwest are similar, but typically more deeply colored (ruby to brick red), and usually stain blue readily.

Gastroboletus amyloideus

Thiers

COMMON NAME:

SPECIES CODE:



FAMILY: Boletaceae

SYNONYMS: None

SUMMARY: Recognized by the top-shaped to highly irregularly sequestrate fruit body, a yellowish, rusty brown to reddish cap, highly convoluted tubes and yellowish to reddish pores, lack of blue staining and strongly amyloid spores. Known from 28 collections, from 10 locations (9 in CA).

TAXONOMIC NOTES: Described by Thiers & Trappe (1969) from Yuba Pass, Sierra County, California. Preliminary data shows that *Gastroboletus amyloideus* and *G. vividus* form a close-knit group with *Boletus smithii*.

DISTRIBUTION: Known from high-elevation forests in the Sierra Nevada and southern Cascade Range. **USA: CA: Siskiyou Co.**, S-TNF, Mount Shasta, Sand Flat. **Shasta Co.**, LVNP, Kings Creek Meadow. LVNP, Terrace-Paradise Trail. **Tehama Co.**, LNF, Gurnsey Creek Campground. **Plumas Co.**, LVNP, trail to Devil's Kitchen. **Sierra Co.**, TNF, Yuba Pass (Type). **Amador Co.**, ENF, Silver Lake. **Tuolumne Co.**, YNP, Tioga Pass. **Fresno Co.**, SieNF, Shaver Lake. **OR:** 1 site.

DESCRIPTION: FRUIT BODY 3–8 cm across, irregularly rounded to top-shaped,

typically quite convoluted in age. **CAP** convex to broadly convex at first, soon irregularly plane, to centrally depressed, or folded upwards in age. Surface dry, dull, smooth to finely velvety. Yellow, golden yellow, ochraceous buff, to rust-brown, often with reddish patches and stains in age. **TUBES/GLEBA** tubular, highly convoluted and interwoven. Yellow when young, becoming olive-yellow, often with reddish streaks or stains 'bleeding' into gleba. **PORES** small, rounded to highly irregular and convoluted. Yellowish to olive-yellow when young, soon with a reddish blush, or more extensively red in age. Not staining, or erratically bruising bluish green. **STIPE-COLUMELLA** 1–2 cm long, 0.5–1.5 cm thick, equal, tapered downwards or greatly reduced, percurrent, occasionally branching. Yellowish at base, with a rosy red band at apex. **FLESH** whitish to yellowish, often with pinkish stains in age. **ODOR** indistinct. **TASTE** mild. **MICROSCOPY: Spores** 13.5–19 x 6–7 μm , fusoid to cylindrical, smooth, thick-walled, strongly amyloid in mass. **Basidia** 26–32 x 7–10 μm , club-shaped, 4-spored, hyaline. **Hymenial cystidia** absent. **Trama hyphae** up to 15 μm broad, interwoven; septa becoming conspicuous; dextrinoid or amyloid in Melzer's reagent. **Cap/peridium epicutis** made up of interwoven to tangled hyphae, 5–7 μm broad, pale ochraceous to dark yellow in KOH and Melzer's reagent. **Clamp connections** absent.

ECOLOGY: Solitary or scattered; fruit bodies forming underground, typically remaining buried, occasionally emerging from duff when mature. Ectomycorrhizal, associated with Pinaceae, especially Red Fir (*Abies magnifica*) and Lodgepole Pine (*Pinus contorta* ssp. *murrayana*). Fruiting in summer and fall.

SIMILAR SPECIES: *Gastroboletus vividus* is very similar, and macroscopic differences are slight. Typically, it has more vivid colors, slightly less deformed fruit bodies, with a more defined stipe; and it lacks the amyloid spores. *Gastroboletus xerocomoides* has an olive-yellow, brown, to vinaceous brown velvety cap, yellow-olive tubes and pores, which stain bluish. It also has slightly wider, (12.8–18 (21) x 6.4–8 μm) amyloid spores, about half of which are distinctly truncate. *Gastroboletus dinoffii* has a thin, concealing peridium with a dull grayish brown upper portion, and deep red on lower parts, an olive tubular gleba, and an indistinct stipe, with a pad-like columella extending into the gleba, and peridium and columella blue-staining. It also has slightly shorter, inamyloid spores, 7–17.5 x 6–7.5 μm . *Gastroboletus ruber* also has a rounded, top-shaped or lobed fruit body, but has a dark rose to reddish brown, smooth, thin peridium which usually disappears, exposing the reddish orange to red, convoluted pores. It typically stains bluish on all parts and has inamyloid spores, which are smaller, (8) 9–15 (20) x 4–6 μm .

Photo: © Michael Wood.

Gastroboletus citrinobrunneus

Thiers

COMMON NAME:

SPECIES CODE:



FAMILY: Boletaceae

SYNONYMS: None

SUMMARY: This sequestrate bolete is recognized by the irregularly convex, bright yellow and brown cap, yellow pores and dark blue staining on all parts. Rare, known from two sites in the northern Sierra Nevada and southern Cascade Range, in true fir forests. *Gastroboletus citrinobrunneus* is a poorly known species; the description below is modified from Thiers (1979), and based on a single collection. More collections are needed to describe variation and ecology of this species.

TAXONOMIC NOTES: Described by Thiers (1979), from near Mineral, Tehama County, California. The genus *Gastroboletus* accommodates a number of species with semisequestrate to sequestrate fruit bodies. These morphological forms have evolved multiple times, within different genera of boletes. Some of these species have been transferred to a corresponding non-gastroid genus while for others, such as *G. citrinobrunneus*, the closest relatives are not known yet.

DISTRIBUTION: Known from mid to high-elevation in the northern Sierra Nevada and southern Cascade Range. Currently known from four collections from two

voucher-confirmed locations. **USA: CA: Tehama Co.**, LNF, near Mineral (Type). **Sierra Co.**, TNF, Yuba Pass. **Plumas Co.**, PNF, near Lake Davis (unconfirmed).

DESCRIPTION: **FRUIT BODY** with an irregular cap and stipe, often convoluted. **CAP** 4–7 cm across, convex to irregularly convex, usually wavy and furrowed. Margin incurved to inrolled, entire when young, often becoming eroded in age. Surface dry, or lubricous when wet, smooth to somewhat appressed-fibrillose near margin. Typically brown to reddish brown on exposed areas, bright yellow to lemon yellow in furrows or creases; occasionally extensively yellow when young, or buried in duff. Staining blue-green when damaged. **GLEBA** tubular, exposed (not enclosed, or surrounded by a peridium), 0.6–1.7 cm long, vertically oriented when young, curving to a 45-degree angle from the stipe-columella at maturity, pale yellow to yellow when young, olive in age; quickly staining dark blue-black when cut. **PORES** small, round to irregular. Bright yellow when young, becoming olive-yellow to olive-brown in age; quickly staining dark blue-green when bruised. **STIPE** 2.5–4 cm long, 0.7–1.5 cm thick at apex, bulbous when young, becoming club-shaped; often pinched at base. Surface dry, smooth. Bright yellow when young, becoming dingy yellow to buff-yellow in age; staining dark blue-black when bruised. **FLESH** relatively thin at disc, very thin towards margin, bright to pale yellow, staining dark blue when cut, slowly aging to grayish blue. **ODOR** indistinct. **TASTE** mild. **MICROSCOPY:** **Spores** 11–15 x 5.4–6.6 μm , fusoid to subellipsoid, often truncate, smooth, moderately thick walled, bright brown in KOH, occasionally amyloid on ends in Melzer's reagent. **Basidia** 21–25 x 8–10 μm , club-shaped, 4-spored, hyaline. **Hymenial cystidia** absent. **Cap cuticle** a trichodermium of more or less upright terminal cells. **Clamp connections** absent.

ECOLOGY: Completely buried to partially exposed in duff under conifers. Ectomycorrhizal, likely associated with White Fir (*Abies concolor*) and Red Fir (*Abies magnifica*), and possibly other members of Pinaceae. Fruiting in summer and fall.

SIMILAR SPECIES: *Gastroboletus turbinatus* (as interpreted by western North American mycologists) is similar, but often with a darker brown to red-brown cap. The pores are often reddish blushed to red-orange; but can also be pale to bright yellow when young. Additionally, it typically has a finely velvety cap, and it lacks truncate spores. *Gastroboletus xerocomoides* (soon to be transferred to *Xerocomellus*) has a vinaceous brown to tan, misshapen cap, yellowish pores and erratic blue staining. *Gastroboletus vividus* has a pink to rosy red cap when young, fading in age, and a yellow stipe with a rosy apex, and non-staining (or rarely, erratically blue-staining) pores and flesh.

Photo: © Daniel Nicholson/www.mushroomobserver.org.

Gastroboletus dinoffii

Nouhra & Castellano

COMMON NAME:

SPECIES CODE:



FAMILY: Boletaceae

SYNONYMS: None

SUMMARY: Recognized by the top-shaped to highly irregular fruit body, a thin, concealing peridium with a dull grayish brown upper portion, and deep red on lower parts, an olive tubular gleba, and an indistinct stipe, with a pad-like columella extending into the gleba. It is one of two *Gastroboletus* species known from California with amyloid trama, but it has inamyloid spores. Apparently quite rare; described from the San Bernardino Mountains under Jeffrey Pine (*Pinus jeffreyi*), known from two sites at Mount Shasta and a single site in Klamath Co., Oregon.

TAXONOMIC NOTES: Described by Nouhra & Castellano (1995) from SBNF. The genus *Gastroboletus* accommodates a number of species with semisequestrate to sequestrate fruit bodies. These morphological forms have evolved multiple times, within different genera of boletes. Some of these species have been transferred to a corresponding non-gastroid genus, while others remain in limbo.

DISTRIBUTION: Rare; known from mid- to high- elevation forest from the San Bernardino Mountains and the southern Cascades. A couple of reports from the

central and southern Sierra Nevada may be this species and should be investigated further. **USA: CA: Siskiyou Co.**, S-TNF, Mount Shasta, Bear Spring, S-TNF, Mount Shasta, Timber Hills. **Riverside Co.**, SBNF, Black Mountain Campground (Type). **OR: Klamath Co.**, Winema National Forest, Chemult Ranger District.

DESCRIPTION: **FRUIT BODY** up to 4.5 cm across, and up to 6 cm tall, irregular, nearly round to top-shaped, with an indistinct stipe or basal projection, peridium completely enclosing the gleba when young. **PERIDIUM** thin, enclosing the gleba, possibly disintegrating in age. Dull grayish brown on upper portion, deep red on underside and in cracks. **GLEBA** gelatinized; locules tubular, intervenose, cross-walled, radiating from base. Olive in color. **COLUMELLA** a broad basal pad, irregularly extending into gleba, occasionally with finer pale veins. Yellow with dark red edges near gleba, veins staining blue. **ODOR** indistinct. **TASTE** unknown. **MICROSCOPY:** **Spores** 7–17.5 x 6–7 (7.5) μm , fusoid, most asymmetrical, smooth, moderately thick-walled; inamyloid, deep yellow in KOH. **Basidia** 18–20 x 6–7 μm , club-shaped, 1- or 2-spored, sterigmata 1.5–3 μm long; **Basidioles** irregularly-shaped, abundant, hyaline, thin-walled. **Trama** 20–30 μm thick, thin-walled, parallel to subparallel hyphae, 3–5 μm broad, with abundant clamp connections; hyaline in KOH, amyloid in Melzer's reagent. **Subhymenium** two or three layers of inflated globose cells, 7–15 μm broad; hyaline to slightly amyloid. **Hymenial cystidia** absent. **Peridium** 200–300 μm thick, a single layer of loosely interwoven, thin-walled, hyaline hyphae, 3–4 μm broad, lacking clamp connections.

ECOLOGY: Completely buried to emergent in duff under conifers. Ectomycorrhizal, likely associated with three-needle pines or with fir. The type was found under Jeffrey Pine (*Pinus jeffreyi*), with White Fir (*Abies concolor*) in the area. The Mount Shasta and Oregon collections were from Ponderosa Pine (*Pinus ponderosa*) and White Fir forest. Fruiting in summer and fall.

SIMILAR SPECIES: *Gastroboletus ruber* also has a rounded, top-shaped or lobed fruit body, but has a dark rose to reddish brown, smooth, thin peridium which usually disappears, exposing the reddish orange to red convoluted pores. Other features are very similar, except it lacks the amyloid trama that *G. dinoffii* has. *Gastroboletus amyloideus* lacks the blue staining, typically has more yellowish colors and has distinctly amyloid spores.

Photo: © Michael Castellano.

Gastroboletus ruber

(Zeller) Cázares & Trappe

COMMON NAME:

SPECIES CODE: GARU2



FAMILY: Boletaceae

SYNONYMS: *Truncocolumella rubra* Zeller

SUMMARY: Recognized by the top-shaped to highly irregularly shaped fruit body, a thin peridium which disappears, exposing the convoluted tubes and pores, and an indistinct stipe, with a pad-like columella extending into the gleba. Additionally, the yellowish, orange-red to deep red colors, bluish staining and large, in-amyloid spores and trama help distinguish this species. Currently known from six California locations; but no new collections since 1980. Also known from an additional ~35 locations in Oregon and Washington.

TAXONOMIC NOTES: Described by Zeller (1939) as *Truncocolumella rubra*, later transferred to the genus *Gastroboletus* (Cázares & Trappe, 1991). The genus *Gastroboletus* accommodates a number of species with semisequestrate to sequestrate fruit bodies. These morphological forms have evolved multiple times, within different genera of boletes. Some of these species have been transferred to a corresponding non-gastroid genus, while others remain in limbo.

DISTRIBUTION: Rare; known from mid- to high- elevation forest in the northern

Sierra Nevada and Cascades. Currently known from six sites in California; and an additional ~35 sites in Oregon and Washington. **USA: CA: Siskiyou Co.**, S-TNF, Mount Shasta. **Shasta Co.**, LVNP, Kings Creek Meadow. LVNP, Paradise Meadows. **Butte Co.**, LNF, near Butte Meadows. **Sierra Co.**, TNF, Chapman Creek Campground. TNF, Yuba Pass. **OR:** 12 sites. **WA:** 23 sites.

DESCRIPTION: **FRUIT BODY** 2–5.5 cm across, 2–4 cm high, irregularly rounded, top-shaped to lobed, with a short to indistinct stipe. **PERIDIUM** very thin, evanescent, soon disappearing, or only remaining in scattered patches near top of stipe, exposing the pores. Yellowish, or reddish where exposed when young, to dark red to red-brown in age. Exposed pores red-orange to red, staining blue when bruised. **GLEBA** of separable tubes when young, more convoluted, maze-like in age. Pale yellow when young, to yellow-olive to dark olive in age, staining bluish when exposed. **STIPE** 0.5–2 cm long, 0.7–1.5 cm thick, short, tapered downward to nearly indistinct. **COLUMELLA** a continuation of stipe into gleba, at times to upper edge, columnar to dendroid, often with many finer branches. Yellowish to yellowish translucent on finer branches, staining bluish when cut. **ODOR** indistinct. **TASTE** mild. **MICROSCOPY:** **Spores** (8) 9–15 (20) x 4–6 μm , subfusoid, smooth, moderately thick walled, pale greenish olive in KOH, inamyloid. **Basidia** 26–40 x 4–14 μm , cylindrical to club-shaped, 2- or 4-spored, thin-walled, hyaline. **Hymenial cystidia** scattered, 25–50 x 7–11 μm , fusoid-ventricose, hyaline, thin-walled. **Trama** 25–170 μm thick, of subparallel to interwoven, hyaline, thin-walled hyphae, 2–12 μm broad. **Peridium epicutis** a palisade of cylindric to club-shaped, hyaline to pale yellow cells, 15–30 (70) x 3–10 μm .

ECOLOGY: Solitary, scattered or in small clusters; fruit bodies forming underground, erupting from duff, but typically remaining partially buried when mature. Ectomycorrhizal, associated with Pinaceae; especially Mountain Hemlock (*Tsuga mertensiana*) and fir (*Abies* spp.). Fruiting in summer and early fall, typically after thunderstorms or summer rains.

SIMILAR SPECIES: *Gastroboletus dinoffii* has a thin, concealing peridium with a dull grayish brown upper portion, and deep red on lower parts, an olive tubular gleba, and an indistinct stipe, with a pad-like columella extending into the gleba. It has slightly wider spores (7–17.5 x 6–7 (7.5) μm), and a distinctly amyloid trama. *Gastroboletus amyloideus* lacks the blue staining, typically has more yellowish colors and has distinctly amyloid spores.

Photo: © Sava Krstic.

Gastroboletus vividus

Trappe & Castellano

COMMON NAME:

SPECIES CODE: GAVI7



FAMILY: Boletaceae

SYNONYMS: None

SUMMARY: A brightly colored sequestrate bolete with a slightly deformed fruit body. Features include a yellow, red blushed to extensively red cap, bright yellow pores when young, which become red in age, and a short yellow stipe with a rosy red band at the apex. Typically, all parts lack blue staining, or will erratically stain blue on older fruit bodies. Currently known from 10 sites in California; 15 total collections.

TAXONOMIC NOTES: Described by Trappe & Castellano (2000) from Jackson County, Oregon. Preliminary data show that *Gastroboletus amyloideus* and *G. vividus* form a closely knit group with *Boletus smithii*.

DISTRIBUTION: Rare; scattered in high-elevation forest in the Sierra Nevada and southern Cascade Range of California, continuing into southern Oregon. Currently known from 15 sites; 10 of which are in California. **USA: CA: Siskiyou Co.,** S-TNF, Mount Shasta, near Panther Creek. S-TNF, Little Glass Mountain. **Shasta Co.,** LVNP, near Kings Creek. LVNP, Summit Lake. LVNP, near Soda Lake. **Sierra**

Co., TNF, Yuba Pass. **Mariposa Co.**, YNP, near Tuolumne Meadows. **Tuolumne Co.**, YNP, Crane Flat. **Fresno Co.**, SieNF, Huntington Lake. SieNF, Rock Creek Rd. **OR:** 5 sites. **Jackson Co.**, Siskiyou Mountains, Jackson Gap (Type).

DESCRIPTION: **FRUIT BODY** from 'normal' bolete-shaped, irregularly top-shaped to highly convoluted. **CAP** 2–5 (8) cm across, typically convex, plane to centrally depressed at first, margins upturned, or curving up and inwards, exposing the pores. Surface dry, felty. Yellow, with reddish patches, to more extensively red. **TUBES** thick, slightly to mostly convoluted, yellowish to olive. **PORES** bright yellow when young, becoming yellow-olive, and developing reddish orange to dark red color in age. Not bluing when bruised. **STIPE** 2–4 cm long, 1–3 cm thick, equal, tapered at base, or abruptly bulbous. Bright to dingy yellow, with a bright rosy red band at apex. **FLESH** pale yellow, often with reddish patches, and a narrow red line immediately beneath cap surface, slowly staining red when cut. **ODOR** indistinct. **TASTE** mild. **MICROSCOPY:** **Spores** (11) 13–18 (22) x 6–7 (8) μm , fusoid, or occasionally obovoid (wider at one end), smooth, inamyloid; pale yellow when solitary, brown-yellow in mass in Melzer's reagent, golden yellow to bright brown-yellow in KOH. **Basidia** 30–45 x 9–11 μm , club-shaped, 4-spored, (rarely 2-spored). **Hymenial cystidia** absent. **Trama** of parallel, thin-walled, hyaline hyphae 2–4 μm broad; most cells slightly inflated. **Cap/Peridium epicutis** of loose tangled hyphae; 4–8 μm broad, slightly inflated. **Clamp connections** absent.

ECOLOGY: Solitary, scattered or in small clusters; fruit bodies forming underground, typically remaining buried, or occasionally erupting from duff when mature. Ectomycorrhizal, associated with Pinaceae, especially Red Fir (*Abies magnifica*), Lodgepole Pine (*Pinus contorta* ssp. *murrayana*), and Mountain Hemlock, (*Tsuga mertensiana*). Fruiting in summer and fall.

SIMILAR SPECIES: *Gastroboletus amyloideus* is very similar, and macroscopic differences are slight. Typically, it has more muted colors, more deformed fruit bodies with a short to indistinct stipe, and distinctly amyloid spores. Less deformed fruit bodies could be mistaken for *Boletus smithii*; a typically larger species, which lacks the deformed tubes. *Gastroboletus xerocomoides* has an olive-yellow, warm brown, to vinaceous brown velvety cap, golden yellow to yellow-olive tubes and pores, which stain bluish. It also has slightly wider (12.8–18 (21) x 6.4–8 μm) amyloid spores, about half of which are distinctly truncate. *Gastroboletus dinoffii* has a thin, concealing peridium with a dull grayish brown upper portion, and is deep red on lower parts, an olive tubular gleba, and an indistinct stipe, with a pad-like columella extending into the gleba. Unlike *G. vividus*, the peridium and columella readily stain blue when handled. It also has slightly shorter, inamyloid spores,

7–17.5 x 6–7.5 μm , and amyloid trama. *Gastroboletus ruber* has a rounded, top-shaped or lobed fruit body, which is often far more convoluted than in *G. vividus*. It also has a dark rose to reddish brown, smooth thin peridium which usually disappears, exposing the reddish orange to red convoluted pores. It typically stains bluish on all parts, and has smaller spores, (8) 9–15 (20) x 4–6 μm .

Photo: © Dimitar Bojantchev.

Leccinum arbuticola

Thiers

COMMON NAME:

SPECIES CODE:



FAMILY: Boletaceae

SYNONYMS: None

SUMMARY: A bolete with mottled, cinnamon-brown to brown caps that grows with Pacific Madrone and manzanita. Recognizable by the combination of cap color, pale scabers on the stipe when young (darkening in age), blue staining (especially on the stipe), and growth with ericaceous host. Most records come from the Nevada City-Grass Valley area in the Sierra Nevada foothills, with other scattered locations in the Sierra foothills.

TAXONOMIC NOTES: Described by Thiers (1975) from near Nevada City, Tahoe National Forest, California.

DISTRIBUTION: Uncommon; known from 29 collections from nine locations in the Sierra Nevada foothills, with a single record from Mendocino County. **USA: CA: Mendocino Co.,** Boonville. **Yuba Co.,** TNF, Bullard's Bar Rec. Area. **Nevada Co.,** TNF, Highway 20 northeast of Nevada City (Type). Near Nevada City. Grass Valley. Grass Valley, 5 miles south on Highway 20. **Amador Co.,** near Fiddletown. **Tuolumne Co.,** Columbia, Big Hill Road east of Columbia. **Mariposa Co.,** StaNF,

near Greeley Hill.

DESCRIPTION: **CAP** 7–10.5 cm across, rounded-convex to convex at first, becoming broadly convex to nearly plane. Margin with sterile tissue, downcurved when young, plane or slightly upturned in age. Surface viscid in wet weather, otherwise moist to dry; often with adhering debris if dry, smooth to obscurely tomentose. Typically mottled with pale brown, buff and whitish when young, (or entirely pallid if buried in duff), soon extensively or mottled cinnamon-brown, brown to rusty brown, fading to pale brown, tan or buff in age. Staining blue when damaged (especially when young). **TUBES** sunken around stipe, up to 1.5 cm deep. **PORES** 0.5–1 mm across, angular. Dark brown to pale grayish brown when young, fading to whitish gray, aging to buff or olive-buff. Staining lavender to olive-brown when bruised. **STIPE** 8–13 cm long, 1–3.5 cm thick at apex, equal or club-shaped; enlarged toward base. White to whitish, covered with moderately dense, whitish to grayish tufts (scabers), these becoming sparser and brown to grayish brown in age. Typically staining intensely blue when damaged. **FLESH** rather thick, very firm when young, softer in cap in age. White, becoming pinkish to reddish, eventually becoming fuscous, then fading to pallid gray. **ODOR** indistinct. **TASTE** indistinct. **KOH** yellow on flesh. **MICROSCOPY:** **Spores** 15–17 x 4.5–6.5 μm , fusiform to sub-cylindric in face view, inequilateral in side view, thin walled, smooth. **Basidia** 25–29 x 9–12 μm , clavate, 1- to 4-spored, hyaline, often filled with conspicuous oil droplets. **Hymenial cystidia** 41–46 x 9–11 μm , spindle-shaped, often with an expanded neck, rare to scattered, embedded and inconspicuous, thin-walled. **Cap cuticle** a tangled trichodermium; hyphae 8–12 μm wide, terminal cells elongated and with a tapered apex, pale yellow in KOH, ochraceous in Melzer's. **Caulocystidia** 25–36 X 7–10 μm , club-shaped to spindle-shaped. **Clamp connections** absent.

ECOLOGY: Ectomycorrhizal with Pacific Madrone (*Arbutus menziesii*) and manzanita (*Arctostaphylos* spp.), scattered fruit bodies produced in fall and early winter, typically covered with leaves and debris.

SIMILAR SPECIES: *Leccinum brunneum* has a dark brown to cinnamon-brown cap, whitish scabers that become dark reddish brown in age, and only shows irregular bluing on the stipe. It's distinguished by these features, as well as by its association with Aspen (*Populus* spp.), not Pacific Madrone and manzanita. Like *L. arbuticola*, *L. manzanitae* is associated with ericaceous hosts, but has an orange-red to brick-red cap and dark scabers.

Leccinum californicum

Thiers

COMMON NAME:

SPECIES CODE:



FAMILY: Boletaceae

SYNONYMS: None

SUMMARY: A white to pale buff-capped bolete growing with aspen. Additional distinctive features include the lack of sterile tissue around the cap margin, lack of staining reactions of the flesh and pale scabers. Very rare; known from two high-elevation aspen groves in the northern Sierra Nevada.

TAXONOMIC NOTES: Described by Thiers (1975) from Grass Lake, El Dorado County, California. *Leccinum* species in general are taxonomically confounded by lack of informative morphological criteria, as well as poorly known and competing species concepts. By virtue of a combination of morphology and ecology, this species is somewhat distinctive, but a pigment abnormality can't be ruled out given the small number of known collections and lack of molecular data. *Leccinum californicum* should be compared genetically with *L. montanum*, which has a brown to gray brown or cinnamon-brown cap, but otherwise is very similar. It co-occurs with this species at both known locations in California.

DISTRIBUTION: Very rare; known from two collections, one each from two sites in

high-elevation aspen groves in the northern Sierra Nevada. **USA: CA: Sierra Co.**, TNF, Yuba Pass. **El Dorado Co.**, Lake Tahoe Basin Management Unit, near Grass Lake.

DESCRIPTION: **CAP** 5–7.5 cm across, rounded to convex when young, becoming broadly convex to plane, margin entire, lacking sterile flaps. Surface smooth, often becoming somewhat fibrillose and often strongly rimose-areolate in age. Whitish to pale buff when young, staying pale buff, or darkening slightly. **TUBES** depressed around stipe, 1–1.5 cm long. **PORES** up to 1 mm across, angular. White to pale buff, becoming pale olive brown to lavender brown, staining dark brown when bruised. **STIPE** 5–8 cm long, 1–1.5 cm thick at apex, equal, or enlarged slightly towards base. White to whitish, at times grayish yellow near base; covered with white to pallid scabers, darkening somewhat when old. **FLESH** firm, moderately thick, white, unchanging or becoming yellowish in stipe base. **ODOR** indistinct. **TASTE** indistinct. **KOH** unknown. **SPORE DEPOSIT** brown. **MICROSCOPY:** **Spores** 14.5–17.5 x 5.5–6.5 μm , fusoid to subcylindric in face view, inequilateral in side view, smooth. **Basidia** 32–37 x 9–12 μm , clavate to pear-shaped, 4-spored, hyaline. **Hymenial cystidia** inconspicuous, 45–55 x 7–10 μm , somewhat spindle-shaped to club-shaped, often with an elongate, tapered neck, very thin-walled. **Cap cuticle** a trichodermium of free hyphal tips, bright red in Melzer's, nearly hyaline in KOH. **Caulocystidia** 40–55 X 10–17 μm , bright red in Melzer's, club-shaped to pointed. **Clamp connections** absent.

ECOLOGY: Ectomycorrhizal. Solitary or scattered in soil and duff under Quaking Aspen (*Populus tremuloides*) at higher elevations. Fruiting in summer and early fall.

SIMILAR SPECIES: *Leccinum montanum* has a brown to gray brown cap, with a somewhat paler, cinnamon-buff to pinkish cinnamon margin when older, white, unstaining or lightly graying flesh and grows with aspen. *Leccinum brunneum* has a dark brown to cinnamon-brown cap, with distinct sterile margin, whitish scabers which become dark reddish brown, and sporadic bluing on the stipe. It also grows with aspen. A number of species associated with birch (*Betula* spp.) superficially resemble *L. californicum*, but are not known to occur in the mountains of California (due to lack of appropriate host trees). Other California *Leccinum* species either have orange to red-brown caps; or are associated with other trees or shrubs.

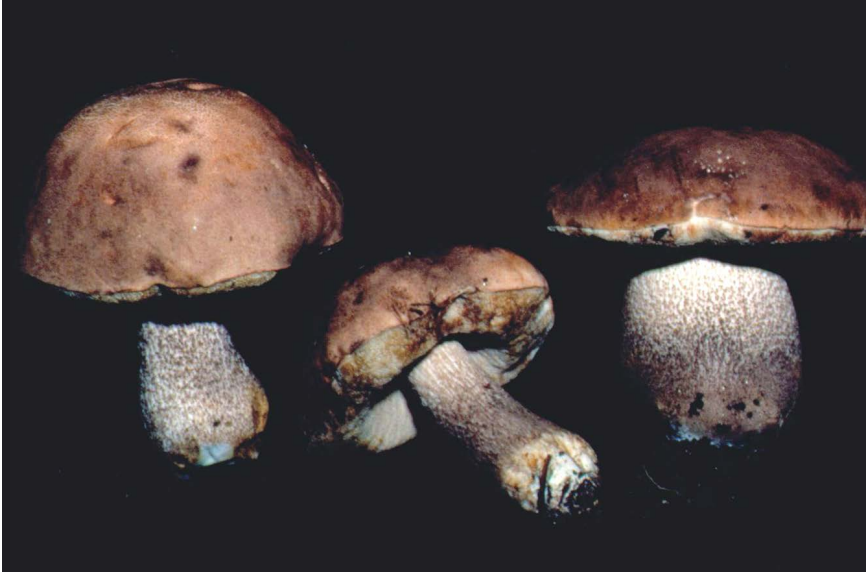
Photo: © Tom Bruns

Leccinum montanum

Thiers

COMMON NAME:

SPECIES CODE:



FAMILY: Boletaceae

SYNONYMS: None

SUMMARY: An aspen-associated bolete with a brown to cinnamon-brown cap that lacks a sterile margin, a whitish stipe with pallid scabers that darken in age, and white, unchanging or slightly graying flesh. Rare; known from four sites in the Sierra Nevada; reported from six sites in the Cascade and Rocky Mountains, and a single collection from Alaska.

TAXONOMIC NOTES: Described by Thiers (1975) from Grass Lake, El Dorado County, California.

DISTRIBUTION: Rare; known from 15 collections from four sites in high-elevation aspen groves in the northern Sierra Nevada. **USA: CA: Sierra Co.,** TNF, Yuba Pass. **Nevada Co.,** TNF, 2 miles upstream from Sagehen Creek Station. **El Dorado Co.,** ENF, Lake Tahoe Basin Management Unit, near Grass Lake (Type). ENF, Lake Tahoe Basin Management Unit, near Fallen Leaf Lake. **OR:** 1 site. **WA:** 1 site. **AK:** 1 site. **WY:** 1 site. **CO:** 1 site. **AZ:** 1 site. **NM:** 1 site.

DESCRIPTION: CAP 3–8 cm across, rounded to convex when young, becoming

broadly convex to plane, margin entire, lacking any overhanging sterile margin tissue. Surface dry to moist, smooth to somewhat tomentose or appressed fibrillose, often shallowly and irregularly pitted or roughened. Brown to gray-brown or cinnamon-brown at first, fading slightly, grayish brown, cinnamon-buff to pinkish cinnamon in age. **TUBES** depressed around stipe, 1–2 cm long. **PORES** up to 1 mm across, angular. White to buff when young, becoming pinkish brown, then lavender-brown in age. Staining yellow-brown to dark brown when bruised. **STIPE** 5–10 cm long, 1–1.5 cm thick, equal. White to whitish, covered with white to pallid scabers when young, scabers darkening brown to black in age. **FLESH** firm, moderately thick, white, unchanging or erratically becoming pale watery gray, rarely bluing in stipe base. **ODOR** indistinct. **TASTE** indistinct. **KOH** unknown. **SPORE DEPOSIT** brown. **MICROSCOPY: Spores** 14–17.5 (20) x 4–6 μm , fusoid to subcylindrical or subellipsoid in face view, inequilateral in side view, smooth. **Basidia** 24–35 x 8–10 μm , clavate to pear-shaped, 4-spored, hyaline. **Hymenial cystidia** inconspicuous, scattered to rare, 30–50 (63) x (7) 12–16 μm , club-shaped to enlogate, often with an elongate, tapered neck, thin-walled. **Cap cuticle** a tangled trichodermium with numerous free hyphal tips, 5–8 μm across, occasional interspersed with large, somewhat fusoid-shaped cells. **Caulocystidia** 30–50 x 8–15 μm , club-shaped, pear-shaped to pointed. **Clamp connections** absent.

ECOLOGY: Solitary or scattered in soil and duff; presumably ectomycorrhizal and associated with Quaking Aspen (*Populus tremuloides*) in higher elevations of the Sierra Nevada, Cascade Range and Rocky Mountains. Fruiting in summer and early fall.

SIMILAR SPECIES: The aspen-associated *Leccinum brunneum* also has a dark brown to cinnamon-brown cap, but has a distinct sterile margin, whitish scabers on the stipe that become dark reddish brown in age, and irregular bluing on the stipe. Another aspen-associate, *L. californicum*, is very similar, but has a white cap that lacks a sterile margin, and white to pallid scabers on the stipe. *Leccinum arbuticola* has an often-mottled cinnamon-brown to brown cap with a sterile margin, pale scabers on the stipe that darken in age, and typically shows pronounced blue staining on the stipe; it can also be distinguished by its growth with Pacific Madrone and manzanita. A number of other aspen-associated *Leccinum* species can be distinguished by their orange, pinkish-orange or cinnamon-orange caps.

Photo: © Harry D. Thiers.

Rubroboletus haematinus

(Halling) D. Arora & J.L. Frank

COMMON NAME: Mountain Satan's Bolete

SPECIES CODE: BOHA2



FAMILY: Boletaceae

SYNONYMS: *Boletus haematinus* Halling

SUMMARY: A large bolete with a brown cap showing a pinkish to reddish margin when young, soon becoming brown to olive-brown or yellow-brown in age, orangish to reddish pores that stain blue when bruised, and a yellowish stipe with fine red reticulation. Locally common in high-elevation true fir (*Abies* spp.) forests in the Sierra Nevada and southern Cascades in California. Currently known from 45 collections comprising 23 voucher-confirmed locations in California. It was considered for listing by the CA Rare Fungi Working Group, who considered it underreported in California, and not in need of being listed.

TAXONOMIC NOTES: Described as *Boletus haematinus* by Halling (Thiers & Halling 1976) from Yuba Pass, Sierra County, California; later transferred to the genus *Rubroboletus* (Frank, 2015).

DISTRIBUTION: Uncommon to locally abundant in the Sierra Nevada and southern Cascades, occurring into southern Oregon. Also known from the southern Rocky Mountains. (*denotes photographic records). **USA:** CA: Siskiyou Co., KNF, Ball

Mountain. KNF, Martin's Dairy. S-TNF, Trout Creek Butte. S-TNF, Sheepheaven Butte. S-TNF, Algoma. S-TNF, Raccoon Creek. S-TNF, Little Glass Mountain. S-TNF, Trout Creek. S-TNF, Cold Creek. S-TNF, Mount Shasta, Red Fir Flat. S-TNF, Harris Springs. **Shasta Co.**, *LVNP, summit area. Whalen Station. **Tehama Co.**, LNF, intersection of Highway 36 and 89. LNF, Mineral Ranger Station. Mrs. Adams' place. **Plumas Co.**, *PNF, Taylor Lake. **Sierra Co.**, San Francisco State University Sierra Nevada Field Campus. TNF, Yuba Pass (Type). **Amador Co.**, ENF, Silver Lake. **El Dorado Co.**, ENF, Echo Summit. *ENF, Rocky Canyon. **Tuolumne Co.**, StaNF, Pinecrest. YNP, Highway 120, between Porcupine Flat and Crane's Flat. YNP, Highway 120. **Fresno Co.**, SieNF, Huntington Lake. **OR**: 8 sites. **NM**: 2 sites. **AZ**: 3 sites. Also reported from Colorado.

DESCRIPTION: CAP 7–25 (31) cm, rounded to convex when young, becoming broadly convex to nearly plane. Surface smooth to appressed-fibrillose, becoming areolate (cracked into a network of patches), more extensively so in age or in dry weather. Pinkish to reddish brown on margin when young (rarely overall), with an olive-gray to brown center, soon light to dark brown, olive-brown or yellow-brown. Flesh in cracks yellowish-tan to reddish. Bruising bluish when damaged. **TUBES** sunken around stipe, 0.8–2 (3) cm long, yellow, staining dark blue quickly when cut. **PORES** small, round to slightly angular. Orange-red to yellow when young, soon red to reddish orange, becoming dingy red-brown to orange-brown, or fading to orange-olive to dingy yellow-olive in age. Staining blue-black quickly when bruised. **STEM** 5–14 cm thick at apex, 5–20 cm long, equal or bulbous lower, with a tapered base. Surface dry, reticulated at apex or sometimes more extensively. Base color yellow to yellow-orange, reticulation red, discoloring from base up in age, staining dark dingy blue when handled. **FLESH** very thick, firm. Lemon yellow, quickly staining blue when cut, reddish in larva tunnels or in stipe base, slowly fading to grayish yellow. **ODOR** indistinct to rancid. **TASTE** mild. **MICROSCOPY:** **Spores** 12–15 x 6–7.5 μm , ellipsoid to spindle-shaped, smooth, moderately thick-walled, pale ochraceous in KOH, ochraceous in Melzer's reagent. **Basidia** 25–40 x 10.5–13.5 μm , clavate, 4-spored. **Hymenial cystidia** rare, 40–45 x 7.5–9 μm , obclavate to ventricose-rostrate. **Cap cuticle** a trichodermium of tangled hyphae with incrustated or punctate walls. **Clamp connections** absent.

ECOLOGY: Ectomycorrhizal with conifers, likely restricted to true firs (*Abies* spp.) in higher elevation forests in the western North American mountains. Often solitary or scattered in small numbers, rarely in large patches. Growing in soil or duff, often in dense, mature and old-growth forests. Fruiting in summer and fall.

SIMILAR SPECIES: *Rubroboletus eastwoodiae* has a paler whitish gray to pinkish cap

and a stipe with a dramatically swollen base and narrow apex; it appears to be restricted to oaks (*Quercus* spp.). *Rubroboletus pulcherrimus* has a pinkish to reddish cap which turns gray to olive-gray in age, more intensely red pores, and a more pronounced red reticulum on the stipe. It occurs in lower elevation coastal forests, especially under Grand Fir (*Abies grandis*) and Western Hemlock (*Tsuga heterophylla*). It is much less common in lower elevation of the Siskiyou and Cascade ranges. *Suillellus amygdalinus* has a liver-red to olive-brown or tan cap, red to orange pores, a tapered, non-reticulate stipe, and grows with oaks (*Quercus* spp.). A somewhat similar looking, undescribed *Neoboletus* species occurs in coastal Sitka Spruce (*Picea sitchensis*) forests; it can be distinguished by its cap color (distinctly red with an olive sheen), finely velvety cap texture, deep red pores, and non-reticulated stipe.

Rubroboletus pulcherrimus

(Thiers & Halling) D. Arora, N. Siegel & J.L. Frank

COMMON NAME: Beautiful Satan's Bolete

SPECIES CODE: BOPU4



FAMILY: Boletaceae

SYNONYM: *Boletus pulcherrimus* Thiers & Halling

SUMMARY: A large bolete with a rosy red to pinkish cap with young (fading grayish in age), red pores, a large, often club-shaped stipe with red reticulation, quick blue to blue-black staining on all parts, and which grows with true firs (*Abies*) and hemlock (*Tsuga*). Known from 12 voucher-confirmed sites (and four more from photos only) in California, this species appears to be restricted to coastal forest, and a few scattered locations in the Klamath Mountains with Grand Fir (*Abies grandis*) and Western Hemlock (*Tsuga heterophylla*).

TAXONOMIC NOTES: Until the past decade, the nomenclature and taxonomy of California's 'Satan's Boletes' was somewhat confounded. The name *Boletus* (*Rubroboletus*) *eastwoodiae* was misapplied to this species; what we now know as *R. eastwoodiae* went by the misapplied name *B. satanas*. Thiers & Halling, (1976) described *B. pulcherrimus* as a new species, and follow-up work has concluded that *B. satanas* is strictly a European species, and the correct name for the California oak-associated satan's bolete is *B. eastwoodiae*. More recently, these species were transferred to the genus *Rubroboletus* (Frank, 2015).

DISTRIBUTION: Uncommon to rare; occurring on the coast of California from Salt Point in Sonoma County, north to the Olympic Peninsula in Washington. Also found in lower elevation forest in the Klamath Range, and western Cascades north into Washington, with a single record from southcentral British Columbia, Canada. Reported from New Mexico and Arizona; these collections should be critically compared with California material, and with *Rubroboletus haematinus*; they likely represent the latter species. **USA: CA: Del Norte Co.**, Crescent City. **Humboldt Co.**, Arcata City Forest. RNP, Davison Road. Prairie Creek Redwoods State Park (photo only). Trinidad Beach State Park. Ferndale, Russ Park (photo only). **Trinity Co.**, S-TNF. **Mendocino Co.**, Jackson State Forest, near Road 408 & Road 409 junction. Jackson State Forest, Highway 20, milepost 11.5. Caspar, near cemetery, near Point Cabrillo Lighthouse. Russian Gulch State Park (photo only). Van Damme State Park, vicinity of Pygmy Forest. Gualala. **Sonoma Co.**, Stewart's Point. Salt Point State Park (photo only). **OR:** ~5 sites. **WA:** 5 sites. **CANADA: BC:** Sicamous.

DESCRIPTION: **CAP** 8–20 (25) cm across, rounded when young, becoming broadly convex, margin with a narrow sterile band, incurved when young, rounded to slightly irregular in age. Color variable, often deep rosy red, burgundy to reddish brown when young, but can be olive to gray with a rosy pink blush on margin. Becoming more grayish olive overall in age. Surface dry, finely velvety to smooth, occasionally with flattened warts or patches, becoming finely cracked in age. **TUBES** Sunken around stipe, 0.5–1.5 cm long. **PORES** very small, round to slightly irregular. Deep red at first, occasionally paler toward margin, becoming orange-red to reddish brown in age. Staining blue-black intensely and immediately when bruised. **STIPE** 7–15 (20) cm long, 3–7 cm thick at apex, club shaped with an enlarged or bulbous base up to 12 cm thick. Red, pink to orangish red, covered with deep red reticulation. Staining deep bluish to bluish black when handled, and discoloring from base up in age. **FLESH** thick, firm. Pale yellow, staining blue quickly when cut, soon fading to grayish yellow, often reddish in lower stipe and around larva tunnels. **ODOR** indistinct. **TASTE** mild. **KOH** brown on cap, tubes, and stipe, orangish brown on flesh. **SPORE DEPOSIT** dark olive-brown. **MICROSCOPY:** **Spores** 13–16 x 5.5–6.5 μm , elongate to subellipsoid, smooth. **Basidia** 35–40 x 9–12 μm , clavate, 1- to 4-spored. **Hymenial cystidia** 33–60 x 8–12 μm , scattered, swollen to nearly spindle-shaped, or narrowly club-shaped. **Cap cuticle** a trichodermium of tangled hyphae with noticeably roughened walls, ochraceous in KOH. **Clamp connections** absent.

ECOLOGY: Ectomycorrhizal with conifers, likely restricted to true firs (*Abies*) and hemlock (*Tsuga*). Growing in soil or duff, often in dense, mature and old-growth

forests. Fruiting in late summer and fall, rarely in winter or spring.

SIMILAR SPECIES: *Rubroboletus eastwoodiae* has a paler whitish-gray to pinkish cap and a stipe with a dramatically swollen base and narrow apex; it appears to be restricted to oaks (*Quercus* spp.). *Rubroboletus haematinus* has a pinkish cap that quickly turns brown as it ages, as well as paler, orangish red pores when young. It is common in higher elevation forest in summer and early fall under *Abies*—especially Red Fir (*Abies magnifica*). *Suillellus amygdalinus* has a liver-red to brownish red cap, red to orange pores, a tapered, non-reticulated stipe, and grows with oak, (*Quercus* spp.). An undescribed *Neoboletus* species occurs in coastal Sitka Spruce (*Picea sitchensis*) forests; it can be distinguished by its cap color (red with an olive sheen), finely velvety cap texture, deep red pores, and non-reticulated stipe.

Suillus discolor

(A.H. Smith, Thiers & O.K. Miller) N.H. Nguyen

COMMON NAME:

SPECIES CODE:



FAMILY: Suillaceae

SYNONYMS: *Suillus tomentosus* var. *discolor* A.H. Sm., Thiers & O.K. Mill.

SUMMARY: This bolete has a creamy buff to cinnamon-brown or olive-brown cap, often covered with grayish fibrils when young, more extensively ochraceous to yellow in age. The pores are ochraceous to ochre-buff, and it has ochraceous cap flesh which slowly stains blue. It is very similar in appearance to *Suillus tomentosus*, but often dingier colored when young, and is associated with five-needle pines (not two- and three-needle pines like *S. tomentosus*). Currently known from two sites in California, two in Washington, ~12 in Idaho, and single reports from Colorado and New Mexico; also reported from Montana and Wyoming.

TAXONOMIC NOTES: Originally described as a variety of *Suillus tomentosus* (Smith et al. 1965), from near Priest Lake, Idaho. Based on morphology and DNA sequence data, elevated to species rank (Nguyen et al. 2017).

DISTRIBUTION: Very rare in the Pacific States, known from two sites in California, a collection from Mount Rainier, and the Olympic Mountains in Washington. The two reported collections from Oregon came from *Pinus contorta* forest and are

likely *Suillus tomentosus*. Most known collections come from around Priest Lake, in northern Idaho. **USA: CA: Inyo Co.**, INF, Ruby Lake. INF, Big Pine Creek, Sixth Lake. **OR:** 1 site. **WA:** 3 sites. **ID: Bonner Co.**, Kaniksu National Forest, Priest Lake (~10 sites are listed in the vicinity of Priest Lake, of unknown distance apart, including the type). **MT:** 1 site. **WY:** 1 site. **CO:** 1 site. **NM:** 1 site.

DESCRIPTION: CAP 4–12 cm across, convex with an incurved margin when young, becoming plane, or wavy in age. Surface densely covered with appressed grayish fibrils or scales when young, viscid below fibrils, occasionally losing fibrils and becoming smooth in age. Creamy buff under grayish fibrils when young, becoming cinnamon-brown to more olive-brown over disc, then dingy cinnamon-brown in age, margin typically paler, dingy ochraceous. Older specimens can lose all sign of scales and be extensively ochraceous to yellow. **TUBES** depressed around stipe to decurrent, 0.5–1 cm long. **PORES** round to slightly angular, up to 0.1 cm across. Dingy ochraceous to ochre-buff, slowly, slightly staining greenish blue, fading brownish when bruised. **STIPE** 3–8 cm long, 1–2 cm thick, equal or narrowed towards base. Surface coarsely, glandular dotted at apex, sparsely dotted lower. Pale to dark ochraceous base color, dots ochraceous to orange-brown when young, becoming dark brown to grayish brown, base color becoming dingy, staining overall when handled. Base with pale ochraceous to salmon-buff mycelium, staining olive-brown to blackish when bruised. With a waxy feeling when handled, and staining fingers brownish. **FLESH** thick, soft, whitish to dingy ochraceous, typically staining blue when broken in cap. Stipe solid, bright orange, ochraceous to more salmon ochraceous to yellow-brown or vinaceous in base, typically not bluing. **ODOR** slightly acid. **TASTE** mild. **KOH** pinkish. **SPORE DEPOSIT** dark olive to yellow-brown. **MICROSCOPY:** Spores 9–12 (13) x 3.8–4.5 μm , oblong, smooth, thin-walled; yellowish to pale rusty brown in KOH, tawny to yellowish in Melzer's reagent. **Basidia** 4-spored. **Pleurocystidia** clustered, 50–90 x 8–12 μm , narrowly fusoid-ventricose to subcylindric with wavy outlines; upper portion mostly hyaline, base with an amorphous, orange-brown wrinkled band or mass in KOH. **Caulocystidia** clustered to scattered, 60–130 x 9–16 μm , subfusoid to clavate-mucronate, hyaline to dark reddish brown in KOH. **Cap cuticle** a trichodermium, hyphae 8–15 μm wide, with copious granular material along the outer gelatinous matrix. **Subcutis** with laticifers with brown amorphous content, and some brown pigment deposits in hyphae. **Clamp connections** absent.

ECOLOGY: Solitary or scattered in soil, ectomycorrhizal with five-needle pines at high-elevations. In California, one collection was associated with Limber Pine (*Pinus flexilis*), the other with Whitebark Pine (*Pinus albicaulis*), in dry subalpine forest on the eastern side of the Sierra Nevada. Fruiting in summer and fall.

SIMILAR SPECIES: *Suillus tomentosus* is very similar. It also has a yellow to golden cap that is often completely covered in grayish yellow fibrils or scales when young. Most of the scales scuff off in age; remaining scales become darker, yellowish to reddish. Additionally, the ochre to yellow pores, resinous to sticky stipe covered with glandular dots, blue-staining flesh are shared features. Although the colors are slightly different, without experience with both species, it's tough to distinguish them. Tree association is the best way to distinguish *S. discolor* from *S. tomentosus*; *S. discolor* only occurs with five-needle pines, whereas *S. tomentosus* occurs with two- and three-needle pines. *Suillus fuscotomentosus* has a dark brown cap when young, grows with two- and three-needle pines, and does not stain blue (or does so only slightly in the stipe base).

Photo: © Cathy L. Cripps.

Suillus imbellus

(Trappe) Kretzer & T.D. Bruns

COMMON NAME:

SPECIES CODE: GAIM

FAMILY: Suillaceae

SYNONYMS: *Gastrosuillus imbellus* (Trappe) Thiers, *Gastroboletus imbellus* Trappe.

SUMMARY: A semi-sequestrate (or possibly randomly environmentally deformed) suilloid bolete with a dry, grayish yellow, dark-fibrillose cap, and small stipe with dark glandular spots. A poorly understood taxon, known from a single collection made in Lane County, Oregon. It may occur in the high Sierra Nevada, Cascades and Klamath Range in California.

TAXONOMIC NOTES: Described from a single fruit body, thus there likely exists significant variation from that which has been described. Attempts to sequence the type collection failed (Kretzer & Bruns 1997), leaving open the possibility that this is simply an aborted/malformed fruit body of a common non-sequestrate species such as *Suillus punctatipes*.

DISTRIBUTION: Very rare; known from a single collection in Lane County, Oregon. May occur south into the Sierra Nevada in California and north into the Washington Cascades. **USA: OR: Lane Co.,** Olallie Ridge Trail, East Fork Mc-Kenzie River.

DESCRIPTION: **CAP** 5 cm across, convex to irregular, moist (not viscid) with appressed fibrils, and often cracked in age. Margin raggedly membranous-appendiculate with sterile tissue. Gray-yellow base color, covered with dark olivaceous fibrils. **TUBES** decurrent, distorted, shallow; 0.2 cm long. **PORES** round to distorted, < 0.1 cm across, mostly blocked by folds and growth of wall tissue. Pale grayish olive. **STIPE** 3 cm long, 1.5 cm thick at apex, equal, with a pinched base, laterally attached. Pale yellow at apex, with brown to black glandular dots, transitioning to a sordid creamy mid-portion to pale salmon with dark brown stains at base. **FLESH** moderately thick, soft, white, with scattered pale yellow stained areas, a rosy zone above the tubes and a narrow olive zone under the cap surface, and a vinaceous blush in stipe base. All parts slowly and erratically staining pale brown where cut. **ODOR** pungent-farinaceous. **TASTE** slightly bitter. **KOH** deep lilac near cap surface on flesh, dark brown on pores, deep lilac at tube base. **MICROSCOPY:** **Spores** 7–10 x 2.5 µm, narrowly to broadly ellipsoid to obovate, smooth, thin-walled, hyaline in KOH, inamyloid. **Basidia** 3–5 (7) x 20–30 µm, thin walled,

hyaline and guttulate in KOH, sterigmata inconspicuous. **Cystidia** clustered, 4–6 x 25–60 µm, cylindric to fusoid-ventricose or irregularly constricted, hyaline to vinaceous to dark brown in KOH with brown material deposited at the base of the clusters. **Cap cuticle** of granulated, pale brown, thin-walled hyphae 3–6 µm across. **Subcuticle** hyphae 5–12 µm broad, with yellow to pale vinaceous debris. **Glandular dots** a parallel arrangement of dark brown, encrusted elements 5–9 µm across. **Clamp connections** absent.

ECOLOGY: Solitary or scattered, completely buried in duff or soil under Mountain Hemlock (*Tsuga mertensiana*) and fir (*Abies* spp.).

SIMILAR SPECIES: *Suillus suilloides* (= *Gastrosuillus suilloides*) has a brown to dark brown cap, whitish to yellowish or olive-yellow to brown pores, and a densely glandular stipe covered with dark brown to blackish spots. It is likely associated with five-needle pines. Based on DNA data, *Suillus suilloides* (= *Gastrosuillus suilloides*), *Suillus amaranthi* (= *G. amaranthi*) and *Suillus umbrinus* (= *G. umbrinus*) are synonymous. Another contorted suillus, *S. megaporinus* (= *S. umbonatus/flavidus* complex) has a dull yellowish buff to warm tan cap, large convoluted pores, and at times is covered with pale orangish brown glutinous slime; this slime leaves mottled reddish spots upon drying/in age. It is common under Lodgepole Pine in the high Sierra Nevada.

Suillus subalpinus

M.M. Moser

COMMON NAME:

SPECIES CODE:



FAMILY: Suillaceae

SYNONYMS: None

SUMMARY: *Suillus subalpinus* is recognized by the patchy whitish, gray-brown, reddish brown to vinaceous brown cap when young, developing orange-brown tones in age, a short, glandular dotted stipe, the lack of any partial veil tissue and growth with Whitebark Pine. Known from a single site in California, but expected from other locations with Whitebark Pine.

TAXONOMIC NOTES: Described by Moser (1997) from a collection made at Grand Teton National Park, in Wyoming. The DNA sequence of the California collection does not cluster with the Montana collections; more collections are needed to resolve this.

DISTRIBUTION: Very rare; known from a single site in California, Mount Rainier in Washington, from the greater Yellowstone region of Wyoming, and a site in the southeastern portion of Shoshone National Forest in Wyoming. Cathy Cripps reports it from northern Montana and southern British Columbia. **USA: CA: Tuolumne Co.,** YNP, Gaylor Lake. **WA:** 1 site. **WY: Teton Co.,** Grand Teton

National Park, near Surprise Lake and Amphitheater Lake (Type).

DESCRIPTION: **CAP** 3–7.5 cm across, convex with an incurved margin lacking sterile tissue when young, becoming broadly convex to plane, occasionally depressed at disc; margin even, occasionally wavy or uplifted in age. Surface smooth, glutinous when young, viscid to tacky in age. Color variable; whitish near margin, gray-brown, reddish brown to vinaceous brown towards disc, often variegated in a blotchy or spotty pattern, less often unicolor, becoming more orange-brown to warm brown in age. **TUBES** 0.3–0.5 cm long. **PORES** small, occasionally radially arranged. White, whitish to ivory when young, developing creamy tones, and maturing yellow. **STIPE** 2–5.5 cm long, 1–2.5 cm thick at apex, equal, or enlarged lower, or tapered downwards, extreme base pointed. White when young, covered with white to reddish, then brownish glandular dots, base color developing yellowish tones in age. **PARTIAL VEIL** absent. **FLESH** moderately thick, firm when young, soft in age, white to faintly yellowish in age. **ODOR** indistinct. **TASTE** mild. **SPORE DEPOSIT** olive to brownish olive. **MICROSCOPY:** **Spores** 6.5–7.7 (9.2) x 2.5–3 (3.8) μm , averaging 7.1 x 2.7 μm , slender cylindrical to subfusoid, smooth, thin-walled. **Basidia** 23–32 x 6.5–8 μm , clavate, 4-spored. **Hymenial cystidia** 40–50 (80) x 6–12 μm , base 2–3 μm wide, clavate or occasionally slightly capitate, solitary or clustered. Colorless or with brown contents, walls encrusted. **Cheilocystidia** 20–90 x 5–9 μm , clavate, often in large clusters. **Cap cuticle** an ixocutis; hyphae 2–2.5 μm wide, hyaline, hyphae in lower layer up to 7 μm wide, pale brown.

ECOLOGY: Solitary or scattered in soil under Whitebark Pine (*Pinus albicaulis*). Fruiting in summer or fall in high-elevation, subalpine forest. Although originally reported to occur with Whitebark and Limber Pine (*Pinus flexilis*) in Wyoming, it appears that *S. subalpinus* is an obligate ectomycorrhizal symbiont of Whitebark Pine.

SIMILAR SPECIES: *Suillus brunnescens* (= *S. borealis* A.H. Sm., Thiers & O.K. Mill.) has a similar colored cap, but has a white to vinaceous gray membranous veil, that leaves remnants on the cap margin and sometimes an annular zone on the stipe, although it can disappear completely in age. It also grows with five-needle pines and seems to occur mostly with Western White Pine (*Pinus monticola*). *Suillus glandulosipes* has a glutinous, variably colored, cinnamon pink, yellowish to reddish brown cap at first, darkening in age to more vinaceous brown; a dotted white stipe; and a partial veil that clings to the cap margin and does not form a ring on the stipe. It grows with two- and three-needle pines.

Photo: © Cathy L. Cripps.

Suillus suilloides

(Thiers) Kretzer & T.D. Bruns

COMMON NAME:

SPECIES CODE:

FAMILY: Suillaceae

SYNONYMS: *Gastroboletus suilloides* Thiers, *Gastrosuillus suilloides* (Thiers) Thiers, *Gastrosuillus amaranthi* Thiers, *Suillus amaranthi* (Thiers) Kretzer & T.D. Bruns, *Gastrosuillus umbrinus* Trappe & Castellano, *Suillus umbrinus* (Trappe & Castellano) W. Klofac

SUMMARY: A sequestrate to semi-sequestrate suilloid bolete with a brown cap, whitish, yellowish olive to brown pores, a whitish to light brown, much reduced stipe, covered with dark glandular dots, and growth with pine help distinguish *Suillus suilloides*. Currently known from 11 sites, 10 of which occur in the Sierra Nevada, Cascades and Klamath Range in California, with a single record from southern Oregon.

TAXONOMIC NOTES: Originally described as *Gastroboletus suilloides* (Thiers & Trappe 1969) from Mammoth Mountain in Inyo National Forest. It was transferred to the genus *Gastrosuillus* (Thiers 1989), and then subsumed into *Suillus* based on molecular phylogenetics (Kretzer & Bruns 1997). Kretzer & Bruns (1997) and Nguyen et al. (2017) showed that there is very little to no genetic difference between *Suillus suilloides*, *S. amaranthi*, and *S. umbrinus*. For this project, we consider them to be synonymous.

DISTRIBUTION: Rare; known from 11 sites, 10 of which are in California. Most sites are in the southern Cascade Range, with scattered sites in the Sierra Nevada, and a single site in the Klamath Range. **USA: CA: Siskiyou Co.**, KNF, Deadfall Meadows, west of Gazelle (Type of *Gastrosuillus umbrinus*). S-TNF, Mount Shasta, Horse Camp. **Shasta Co.**, LVNP, Manzanita Lake. LVNP, Crumbaugh Lake. **Tehama Co.**, LVNP, Highway 89, 1 mile north of junction with Highway 36 (Type of *Gastrosuillus amaranthi*). Mineral Home Owners' Water Supply Spring. **Lassen Co.**, LVNP, Juniper Lake, north shore. **Amador Co.**, ENF, Silver Lake Campground. **Mono Co.**, INF, Mammoth Mountain, ski lift area (Type). **Fresno Co.**, SieNF, Huntington Lake. **OR:** 1 site.

DESCRIPTION: FRUIT BODY 1–5 cm across, rounded, convex to broadly convex when young, typically irregularly lobed, or with an upturned margin. Surface smooth, or with a sparse tomentum, occasionally appressed-fibrillose to finely

scaly in age. Light brown, cinnamon-brown to dark brown. **TUBES** broadly attached to decurrent, vertically to horizontally aligned, typically quite contorted and anastomosing, 0.3–1.7 cm long. **PORES** rounded to angular, 0.05–0.2 cm wide. White, buff, greenish yellow to olive-yellow or dark brown. **STIPE** 0.5–2.5 cm long, 0.3–1.5 cm thick, typically much reduced, swollen in middle, or tapered downward. Whitish to pale brown with dark brownish to blackish glandular dots. **FLESH** 0.3–0.7 cm thick, white, buff to light brown, or yellowish. **ODOR** indistinct. **TASTE** mild. **KOH** purple on cap. **MICROSCOPY: Spores** 6.5–12 x (3) 3.5–4.5 μm , ellipsoid to subcylindrical, with eccentric apiculus, smooth, thin-walled, hyaline to pale brown in KOH, inamyloid in Melzer's reagent, cyanophilic. **Basidia** 18–37 x 6–8 (9) μm , narrowly clavate to subcylindrical, hyaline in KOH, 4-spored. **Hymenial cystidia** in two forms: Solitary, clavate to cylindrical, thin-walled cystidia 25–55 x 5–11 μm , dark brown in KOH and Melzer's reagent. Larger clustered cystidia 60–90 x 6–9 μm , obtuse cylindrical, thin-walled, hyaline; bases obscured by dense deposits of vinaceous to brown, amorphous material. **Tube trama** composed of parallel to interwoven thin-walled hyphae, 1.5–3 μm broad; a few cells slightly inflated. Peridial cuticle of interwoven, subparallel to tangled hyphae, (3) 5–10 (12) μm broad, yellow to dark brown in KOH and Melzer's reagent, often obscured by abundant, brown granules. **Peridial flesh** of interwoven, hyaline, thin-walled hyphae, with scattered, extracellular, brown granules; hyphae 4–30 μm broad at septa, with most cells inflated, up to 50 μm broad. **Clamp connections** absent.

ECOLOGY: Solitary or scattered, completely buried in duff or soil. Ectomycorrhizal, likely associated with five-needle pines. Fruiting from late spring into fall (till the end of November).

SIMILAR SPECIES: *Suillus imbellus* is a semi-sequestrate (or possibly randomly environmentally deformed) suilloid bolete with a dry, grayish yellow, dark-fibrillose cap, and small stipe with dark glandular spots. Microscopically, it has smaller spores (7–10 x 2.5 μm), and it grows with Mountain Hemlock (*Tsuga mertensiana*). Another contorted suillus, *S. megaporinus* (in the *S. umbonatus/flavidus* complex), has a dull yellowish buff to warm tan cap, large convoluted pores, and its cap is covered with pale orangish brown glutinous slime; this slime leaves mottled reddish spots upon drying and with age. It is common under Lodgepole Pine (*Pinus contorta*) in the high Sierra Nevada.

Tylopilus ammiratii

Thiers

COMMON NAME:

SPECIES CODE:



FAMILY: Boletaceae

SYNONYMS: None

SUMMARY: A large bolete with a vinaceous cap when young that becomes brown with age, white to pallid pores that become buff in age and stain brown when bruised, and a white, non-reticulate stipe. Known from six locations, mostly associated with Black Oak (*Quercus kelloggii*).

TAXONOMIC NOTES: Described by Thiers (1975) from Shasta County, California. DNA sequences from this species should be compared with sequences from *Tylopilus indecisus* sensu California.

DISTRIBUTION: Rare; known from six sites, four in the Cascades and Sierra Nevada foothills, one in the Klamath Range, and one on the San Francisco Peninsula. **USA:** **CA:** Siskiyou Co., SRNF, near Somes Bar. **Shasta Co.**, Shasta Trinity National Forest, near Dog Creek Bridge. Castella, Castle Crags (Type). **Nevada Co.**, (TNF?) near Nevada City. Grass Valley. **San Mateo Co.**, Huddart County Park.

DESCRIPTION: **CAP** 5–10 cm across, rounded when young, becoming bun-shaped to broadly convex, to plane or wavy in age. Surface dry to tacky, smooth. Vinaceous

to vinaceous brown when young, becoming brown to buff, developing ochraceous tones in age. Staining dark brown to olive-brown when bruised. **TUBES** 0.8–1.5 cm long, sunken around stipe, at times with slight reticulation at apex formed by slightly decurrent tubes. **PORES** Very small, round to slightly irregular. White to pallid when young, becoming buff to vinaceous buff, staining brown when bruised. **STIPE** 4–9 cm long, 1.5–2.5 cm thick at apex, equal, tapered downward, or more rarely club-shaped, with a slightly enlarged base. Surface dry, smooth to scurfy-pruinose, lacking reticulation, or with slight reticulation at apex. White, staining vinaceous to brown when bruised. **FLESH** thick, firm. White to pale vinaceous buff when young, whitish to buff in age, unchanging, or slowly staining brown when cut. **ODOR** indistinct. **TASTE** mild. **KOH** unknown. **SPORE DEPOSIT** unknown (likely pinkish buff). **MICROSCOPY: Spores** (7.5) 8.5–11.5 (13.5) x 3–4 μm , subfusoid to cylindrical, inequilateral, smooth, thin-walled. **Basidia** 20–25 x 5–8 μm , clavate, 4-spored. **Hymenial cystidia** 45–69 x 5–10 μm , scattered to abundant, clavate to irregular. **Cap cuticle** a trichodermium of tangled hyphae, 3–5 μm wide. **Clamp connections** absent.

ECOLOGY: Ectomycorrhizal with hardwoods, likely primarily with Black Oak (*Quercus kelloggii*). Also reported from under manzanita (*Arctostaphylos* spp.) and Pacific Madrone (*Arbutus menziesii*), although these reports may involve other *Tylopilus* taxa. Fruiting from early fall into winter.

SIMILAR SPECIES: *Tylopilus indecisis* (sensu California) has a variably colored cap; typically it has an amethyst purple blush when young, soon mottled dingy tan-gray to pinkish tan with beige areas and extensive brown streaking, to darker brown overall in age. *Tylopilus indecisis* also has a distinctly reticulated stipe and slightly larger spores (10.5–13 x 3–5 μm). *Tylopilus indecisis* was described from eastern North America—although the name is used for the California species, it is now known to be misapplied. It's possible that we need to broaden the concept of *T. ammiratii* to include *T. indecisis* sensu California, or describe the California concept of *T. indecisis* as a new species. *Tylopilus humilis* is has a pinkish brown, brown to yellow-brown cap, and a short stipe, and a stunted stature. It's only known from a few sites on the California coast. *Leccinum* species have brown to orange caps, and stipes with dark scabers, at least with age.

Photo: © Michael Wood.

Xerocomellus rainisiae

(Bessette & O.K. Mill.) N. Siegel, C.F. Schwarz & J.L. Frank

COMMON NAME:

SPECIES CODE:



FAMILY: Boletaceae

SYNONYMS: *Cyanoboletus rainisiae* (Bessette & O.K. Mill.) Gelardi, Vizzini & Simonini (as *Cyanoboletus rainisii*), *Boletus rainisiae* Bessette & O.K. Mill. (as *Boletus rainisii*).

SUMMARY: A medium-sized bolete with an olive-brown to yellowish brown cap, with a velvety surface that becomes areolate-cracked in age, yellowish stipe with red tones near the base, and often extensive, dark greenish blue to bluish black staining on the lower stipe. Most western records of *Boletus pulverulentus* likely refer to *Xerocomellus rainisiae*, although some of these records might involve the similar *X. mendocinensis*. Reported from four sites in California (as *B. pulverulentus*), with 25 Pacific Northwest records.

TAXONOMIC NOTES: Long known by a misapplied name, *B. pulverulentus*, this western bolete was described as *B. rainisii* by Bessette et al. (2000) and transferred into *Xerocomellus* (Frank, 2014). The epithet *rainisiae* is correct (*rainisii* is an orthographic variant). *Xerocomellus* species are notoriously difficult to identify, and there has been much confusion regarding variation within and among the species. Furthermore, original species concepts and uncertainty about which names to

use have added to the confusion.

DISTRIBUTION: Occurring on the North Coast of California inland to Mount Shasta, with an unconfirmed report from the northern Sierra Nevada; from the coast to the Cascades in Oregon and Washington and on Vancouver Island in British Columbia. **USA:** (As there has been much confusion regarding the identity of this species, and *Xerocomellus* in general, these records should be scrutinized). **CA:** Del Norte Co., Fort Dick. Prairie Creek Redwood State Park, Ruggs Cove. Trinity Co., S-TNF, Denny Road. Siskiyou Co., S-TNF, Mount Shasta, Horse Camp. Nevada Co., TNF, near Nevada City (unconfirmed). **OR:** 6 sites. **WA:** 18 sites. **CANADA:** BC: 1 site.

DESCRIPTION: **CAP** 4–12 cm across, rounded to convex when young, becoming broadly convex to nearly plane; margin down-curved, becoming even, occasionally uplifted in age. Surface dry, velvety to velvety tomentose when young, more appressed-tomentose and conspicuously areolate in age. Dark olive, olive-brown to blackish brown when young, becoming paler olive-brown, olive-gray to yellowish brown with yellowish flesh showing between cracks in age, instantly staining greenish black when damaged. **TUBES** broadly attached, or with a narrow notch at stipe, 0.5–1.5 cm long. **PORES** tiny, round to angular. Yellow to golden yellow when young, becoming dark golden yellow to yellow-olive, and often developing a reddish blush with age. Quickly staining dark blue-green when bruised, then slowly brownish. **STIPE** 3–9 cm long, 1–3.5 cm thick, club-shaped with an enlarged base when young, becoming more equal with age, typically with a pinched base at all stages. Surface dry, smooth; base with white mycelium. Bright yellow to golden yellow, often tinged with reddish longitudinal streaks, and red blotches near base. Staining dark blue-green to dark teal-blue to greenish black when handled. **FLESH** moderately thick, firm, yellow with red in stipe base and around larva tunnels, staining blue when cut. **ODOR** indistinct. **TASTE** indistinct. **KOH** reaction on flesh and surfaces unknown. **SPORE DEPOSIT** olive-brown. **MICROSCOPY:** **Spores** 10–17 x 4–7 μm , ellipsoid to ventricose in face view, inequilateral and narrowly ellipsoid in side view, smooth, ochraceous in KOH. **Basidia** 37–55 x 9–14 μm , narrowly clavate, thin walled, hyaline in KOH. **Hymenial cystidia** 35–58 x 8–12 μm , ventricose-rostrate to fusoid-ventricose, smooth, thin-walled, hyaline, with ochraceous content in KOH. **Cap cuticle** a trichodermium with narrowly clavate to fusiform end cells. **Clamp connections** absent.

ECOLOGY: Scattered to gregarious, rarely solitary, fruiting from duff and soil. Ectomycorrhizal with a host of different conifers, seemingly with a preference for old-growth forest. Fruiting in fall and early winter.

SIMILAR SPECIES: *Xerocomellus amylosporus* has a dark olive-brown to vinaceous brown cap with scattered and irregular cracks, pores that bruise dark inky blue, and a yellow stipe with reddish punctations, soon developing dingy brownish tones, and spores that are more reddish brown in color. *Xerocomellus mendocinensis* has quickly blue-staining pores and a more coarsely punctate stipe that is often evenly red or with a distinct red belt near the apex. *Xerocomellus diffractus* has a paler, olive-brown, leather brown to tan cap, pale yellow pores that slowly stain blue and a yellowish stipe with scattered reddish punctations. None of these three species shows the intense dark blue-green to greenish black staining on the stipe that *X. rainisiae* has. *Xerocomellus dryophilus* has a similar cap texture, but typically has a brighter red cap (it can fade to tan or olivaceous), and a bulbous red stipe base; it is common in central and southern California under oaks (it is not expected to co-occur with *X. rainisiae* in any part of their ranges).

POLYPORES



Albatrellus ellisii

(Berk.) Pouzar

COMMON NAME: Greening Goat's Foot

SPECIES CODE: ALEL4



FAMILY: Albatrellaceae

SYNONYMS: *Albatrellopsis ellisii* (Berk.) Teixeira, *Polypilus ellisii* (Berk.) Teixeira, *Polyporus ellisii* Berk., *Scutigera ellisii* (Berk.) Murrill.

SUMMARY: A medium-sized to large mushroom with a hairy to scaly-tufted, yellow to brown cap, whitish to cream pores, an off-center to lateral stipe, and a tendency for all parts to discolor greenish. Known from mid-to high-elevation conifer forests in the Sierra Nevada, Cascades and Rocky Mountains.

TAXONOMIC NOTES: *Albatrellus ellisii* was described from southern New Jersey. Modern taxonomic work is needed to compare eastern collections with their western counterparts; they are likely distinct species. Some authorities place this species in the genus *Scutigera*.

DISTRIBUTION: Scattered in higher elevation forests in the Sierra Nevada, Cascade and Klamath ranges in California, Coast Range and Cascades in Oregon and Washington and throughout the Rocky Mountains. Also known from New Jersey south into North Carolina and Tennessee. **USA: CA: Siskiyou Co.,** KNF, Duck Lake area, near Callahan. S-TNF, Raccoon Creek. S-TNF, 1 mile southeast of Red

Tank Spring. **Butte Co.**, PNF, near Merrimac. **Sierra Co.**, TNF, Yuba Pass. TNF, near Bassetts. **Yuba Co.**, TNF, Bullard's Bar Rec. Area, Hornswoggle Campground. **El Dorado Co.**, LTBMU, near Lily Lake (unconfirmed). **Tuolumne Co.**, YNP, north side of Glacier Pt Road. **Fresno Co.**, KCNP, Huckleberry Meadow **OR**: ~20 sites. **WA**: ~15 sites. **CANADA: BC**: 4 sites.

DESCRIPTION: **CAP** 8–25 cm across, circular to lobed or fan-shaped, convex with an inrolled margin at first, becoming plane or undulating with age. Surface dry, hairy to tomentose, covered with vaguely radially-arranged tufts of hairs, becoming more matted or scale-like in age. Color variable, golden yellow to medium brownish, developing green stains and darker brown colors in age. **PORES** forming a slightly decurrent layer, mouths round to irregular, often becoming ragged in age. Whitish to cream, typically staining greenish to greenish yellow when bruised, discoloring dingy yellow or with greenish stains in age. **STIPE** 3–10 cm long, 2–4 (6) cm thick, off-center to lateral, more or less equal to irregular. yellow-brown, yellow-cream, typically with greenish stains. **FLESH** thick, very firm, cream to beige, often greenish stained in age, or slowly staining greenish when cut. **ODOR** indistinct or slightly unpleasant when young, in age rancid or strongly unpleasant. **TASTE** mild when young, unpleasant in age. **SPORE DEPOSIT** white. **MICROSCOPY:** **Spores** 8–10 x (5.5) 6–7 μm , ellipsoid to tear-drop shaped, smooth, inamyloid. **Basidia** 40–48 x 8–10 μm , clavate, 4-spored. **Hymenial cystidia** absent. **Clamp connections** present.

ECOLOGY: Ectomycorrhizal with conifers. Growing in soil or duff in mature or old-growth montane forests. Fruiting in late summer and fall; fruit bodies may persist into winter.

SIMILAR SPECIES: *Albatrellus pes-caprae* (= *Scutigera pes-caprae*) has a reddish brown to brown, fibrous-scaly cap and white to creamy pores that have less of a tendency to stain greenish. It's more common in coastal, mixed hardwood-conifer forests. *Jahnporus hirtus* has a velvety, brown to grayish brown cap, white pores, an often long-tapering stipe base, a strongly bitter taste, and grows on or near decaying stumps and buried roots. Microscopically, it has spindle shaped to cylindrical spores measuring 12.5–17 x 4.5–5.5 μm . *Bondarzewia occidentalis* (= *B. mesenterica* sensu western North America) is typically larger, has a brown to grayish brown cap center, transitioning to warmer and often paler yellowish brown to ochre-brown outward, with a beige to whitish margin. Its cap surface is finely velvety, at times with scattered felty patches or small hairy scales, becoming smoother in age. Microscopically, it has globose to subglobose spores ornamented with strongly amyloid ridges and warts.

Bondarzewia occidentalis

Jia J. Chean, B.K. Cui & Y.C. Dai

COMMON NAME:

SPECIES CODE:



FAMILY: Bondarzewiaceae

SYNONYMS: None

SUMMARY: Recognized by the large size, growth at the base of (often large) trees or stumps, shelf-like to rosette lobed fruit body with brownish, often zonate caps, whitish pores, an acrid to bitter taste, and globose spores with amyloid warts and ridges. It appears to be restricted to old-growth forests, or large old stumps. Although this species is borderline to warrant listing it as a “rare species” based on number of collections, we have included it based on the significant decline, and loss of suitable habitat. Many recent observations are from legacy stumps in forests that were logged in the 1960’s and 1970’s. Most of these stumps are becoming too decayed for this species, and a population collapse is expected.

TAXONOMIC NOTES: Long known as *Bondarzewia mesenterica* or *B. montana*. DNA sequencing (Chen et al. 2016) showed that the western North American species is distinct from the European *B. mesenterica*, and it was described as *B. occidentalis*.

DISTRIBUTION: Occurring from the central Sierra Nevada, north into the Cascades and the northern California coast, into coastal British Columbia, east into the

Rocky Mountains in Idaho. (An asterisk denotes photographic records). **USA: CA: Del Norte Co.**, Crescent City. SRNF, location unknown. **Humboldt Co.**, McKinleyville, Murray Road. Prairie Creek Redwood State Park. RNP, Wolf Creek Environmental Education Center. RNP, Tall Tree Trail*. Big Lagoon*. Arcata, Redwood Park*. **Mendocino Co.**, Little River*. **Siskiyou Co.**, KNF, northeast of Somes Bar. KNF, 2 miles east of Marble Mountain Ranch. KNF, location unknown. S-TNF, McGinnis Springs. S-TNF, Mount Shasta, Sand Flats. S-TNF, near Bartle. S-TNF, near Trout Creek. **Shasta Co.**, LNF, Peavine Creek. **Tehama Co.**, MeNF, Croney Ridge. LNF, Morgan Summit. LNF, near Mineral. **Butte Co.**, PNF, Merriam. **Sierra Co.**, TNF, Chapman Creek Campground. TNF, Yuba Pass. **El Dorado Co.**, ENF, Mount Ralston trail*. ENF, near Echo Summit*. **Tuolumne Co.**, StaNF, Stanislaus-Tuolumne Experimental Forest*. YNP, along Glacier Point Road. YNP, Tioga Road. Also known from 170+ collections, from 100+ locations in Oregon, Washington and Idaho.

DESCRIPTION: **FRUIT BODY** 5–35 (50) cm across, lumpy and irregular at first, expanding into a single or more often compound uplifted rosette of fan-shaped lobes. **UPPER SURFACE** moist to dry, finely velvety with scattered felty patches or small hairy scales, smoother in age. Brown to grayish brown at center, warmer and often paler outward; yellowish brown to ochre-brown, usually with a beige to whitish margin, often with light and dark zones. **PORES** small, round at first, soon irregular, becoming rather jagged in age. White to cream, occasionally with pale yellowish buff stains in age. **STIPE** indistinct or central to lateral, often tapered downward and rooting. Brown when exposed, dingy whitish if buried. **FLESH** thick, tough, fibrous, whitish to creamy. **ODOR** pleasant when young, rancid in age. **TASTE** mild, acrid to slightly bitter. **SPORE DEPOSIT** white. **MICRO-SCOPY:** **Spores** 6–8 x 5–7 μm , globose to subglobose ornamented with strongly amyloid ridges and warts. **Basidia** 40–55 x 10–12 μm , broadly clavate, 4-spored. **Cystidia** absent. **Hyphal system** dimitic: Context generative hyphae 4–8 μm wide, thin-walled, simple-septate, with rare branching. Context skeletal hyphae 3–8 μm wide, thick-walled, aseptate, with infrequent branching. Tramal hyphae thin-walled, simple-septate, 2.5–4 μm wide.

ECOLOGY: Solitary or with a few scattered fruit bodies at the base of mature trees and large stumps of conifers, especially Red Fir (*Abies magnifica*) and Sitka Spruce (*Picea sitchensis*) in California, larch (*Larix* spp.), and Douglas-fir (*Pseudotsuga menziesii*) in the north. Fruit bodies are annual but can persist for months. Causing white stringy rot of the heartwood of roots and butts of living conifers, continuing to fruit after the tree dies.

SIMILAR SPECIES: *Jahnoporus hirtus* has a finely velvety gray to brown single (rare two-lobed) cap and a more well-defined stipe, a bitter taste, and smooth, spindle-shaped to cylindrical spores. *Laetiporus* species are bright golden yellow to orange when young and grow on trees or stumps.

Bridgeoporus nobilissimus

(W.B. Cooke) T.J. Volk, Burds., & Ammirati

COMMON NAME: Noble Polypore

SPECIES CODE: BRN08



FAMILY: Polyporaceae

SYNONYMS: *Fomes nobilissimus* (W.B. Cooke) J. Lowe, *Oxyporus nobilissimus* W.B. Cooke

SUMMARY: The large size, coarsely fuzzy upper surface, whitish to creamy pores, and occurrence on large old fir trees and stumps help distinguish this species. Currently known from a single site in California; in Redwood National Park. This species could occur in wetter parts of the Klamath and Cascade ranges. Despite extensive surveying, only about 100 fruit bodies of this species have ever been found, most of which are in the Cascade Range in northern Oregon and, unfortunately, most are on large fir stumps in logged forests.

TAXONOMIC NOTES: Described by Cooke (1949) as *Oxyporus nobilissimus* from Mount Rainier National Park, Washington. Burdsall et al. (1996) coined the genus *Bridgeoporus* to accommodate this species.

DISTRIBUTION: Rare. Known from a single site in California, in RNP. Known from about 100 (based on 2008 data) fruit bodies, from ~30 populations. Most known sites are in the Cascade Resource Area of the US Bureau of Land Management

(BLM) Salem District in Clackamas, Marion, and Linn counties, on the west slope of the Cascade Range in northern Oregon, from 300 to 1300 m in elevation. A single disjunct site occurs in the Oregon Coast Range, in Siuslaw National Forest, at Mary's Peak. At least four sites are known in Washington, on the western slope of the Cascades, north to at least Snoqualmie Pass. A single site occurs on the Olympic Peninsula in Washington. Not known to occur in British Columbia. **USA:** **CA:** Humboldt Co., RNP. **OR:** 25 sites. **WA:** 4 sites.

DESCRIPTION: **FRUIT BODY** 30–100 (140) cm across, typically shelflike or hoof shaped; occasionally toplike or rounded with a central stipe when growing on top of cut stumps. **UPPER SURFACE** coarsely hairy or fuzzy. Off-white, creamy to beige on growing margin, often with green algae, moss, and other debris accumulating on top. **PORES** very small, round. White to creamy beige, occasionally buff when old. **STIPE** generally absent, except when fruiting on top of stumps. **FLESH** very thick, tough, fibrous, whitish. **ODOR** indistinct. **TASTE** not sampled. **KOH** no reaction. **SPORE DEPOSIT** white. **MICROSCOPY:** **Spores** 5.5–6.5 x 3.5–4.5 μm , subglobose to ovoid, smooth, inamyloid. **Basidia** 12–18 x 4–10 μm , pear-shaped, 4-spored. **Pleurocystidia** up to 125 x 6–12 μm , cylindric to broadly awl-shaped, arising from deep in trama, often with colorless crystalline cap; walls slightly thickened to thick (up to 4 μm in age). **Hyphal system** monomitic.

ECOLOGY: Growing at base of standing snags or large stumps of large old firs (*Abies* spp). Fruiting is limited to mature firs with a trunk diameter of at least 1 m. Fruit bodies perennial, growing for many years. Ecology and life cycle of *B. nobilissimus* are largely unknown: Most fruit bodies are found on dead trees or stumps, but Gordon & Van Norman (2015) showed that *B. nobilissimus* has a significant mycelial presence in living trees, occurring in 22% of those they surveyed (in stands where a fruit body was found). It likely needs many years of growth in mycelial stage, and trees reaching sufficiently girth before being able to produce large, long-lived fruit bodies. All but two of the recorded fruit bodies come from *Abies procera*. The geographic outliers are the only ones known from other *Abies* species: *A. grandis* in Redwood National Park, California, and *A. amabilis* in Olympic National Forest, Washington. Gordon & Van Norman (2015) found the mycelium also present in *Tsuga heterophylla*, *Pseudotsuga menziesii* and *Thuja plicata*, but fruit bodies have never been found on these species.

SIMILAR SPECIES: *Pseudoinonotus dryadeus* can have similar (and massive) fruit bodies, but lacks the coarsely hairy surface, is often covered with clear to brownish exuded droplets when young, and typically has browner colors in age. Although more common on oaks, it occurs on firs in the Cascades and Sierra Nevada.

Laricifomes officinalis

(Vill.) Kotl. & Pouzar

COMMON NAME: Agarikon

SPECIES CODE:



FAMILY: Polyporaceae

SYNONYMS: *Boletus officinalis* Vill., *Polyporus officinalis* (Vill.) Fr., *Piptoporus officinalis* (Vill.) P. Karst., *Cladomeris officinalis* (Vill.) Quél., *Ungulina officinalis* (Vill.) Pat., *Fomes officinalis* (Vill.) Bres., *Fomitopsis officinalis* (Vill.) Bondartsev & Singer, *Agaricum officinale* (Vill.) Donk, *Boletus laricis* F. Rubel, *Fomes laricis* (F. Rubel) Murrill, *Boletus purgans* J.F. Gmel., *Boletus agaricum* Pollini, *Fomes fuscatus* Lázaro Ibiza

SUMMARY: *Laricifomes officinalis* is a large, hoof-shaped to multi-tiered polypore, with pallid colors, crumbly-chalky flesh, and extremely bitter taste. Typically growing high up on the trunks of both living and dead mature or old trees. There are 41 herbarium collections (with data) of *Laricifomes officinalis* from California, only 6 collections have been made in the last 60+ years, (two in the last 40, and one in the last 30). There have been ~20 recent (past 15 years) reports of this species on Mushroom Observer, iNaturalist and personal observations from California, most occurring on old trees. Although this species does not fall under “rare status” based on number of collections, the significant decline, and loss of suitable habitat warrants it being listed.

TAXONOMIC NOTES: Long known as *Fomitopsis officinalis*, DNA sequence has supported the placement in the genus *Laricifomes*.

DISTRIBUTION: Once widespread in the conifer band across western North America, the Great Lakes region, northern Europe and Russia, it has since disappeared from much of its historic range (Mukhin et al. 2005, Svetasheva et al. 2015). For instance, it has not been seen in the Midwest since 1974 (Lindner et al. 2006). In western North America, most reports come from old-growth, montane forests. In California, it occurs in coastal forests from Monterey County northward, in the Coast Range, and from Sequoia NP in the southern Sierra Nevada, north through the Cascade and Klamath ranges into the Pacific Northwest, at least into coastal southeast Alaska. Also occurring in the Rocky Mountains, south into Arizona and New Mexico. (The below list is of both collections and photographic records, for California only, ones marked with an asterisk denote herbarium specimens). **USA: CA: Humboldt Co.**, SRNF, Horse Mountain. SRNF, near Willow Creek*. Near Korbel*. **Trinity Co.**, Buckeye Mountain*. South Fork, Trinity River watershed. **Siskiyou Co.**, KNF, Marble Mountains. S-TNF, near Lake McCloud. S-TNF, Mount Shasta, Deter Camp*. S-TNF, Mount Shasta, Sand Flat*. S-TNF, Mount Shasta, Sisson Southern Trail*. S-TNF, Mount Shasta, south of Red Butte*. S-TNF, Squaw Valley Creek* S-TNF, near Six Shooter Butte. **Shasta Co.**, S-TNF, Lake Shasta, Pitt Arm. LVNP, 1962 Blowdown area*. LVNP, near Summit Lake*. **Lassen Co.**, LNF, Blacks Mountain Experimental Forest*. LNF, Facht Siding*. **Plumas Co.**, PNF, Massack*. PNF, near Sloat*. **El Dorado Co.**, ENF, Echo Lake. ENF, Sand Mountain. ENF, Toll House Flat, (Camp Sacramento)*. **Tuolumne Co.**, YNP, Dana Fork of Tuolumne River*. YNP, Tuolumne Meadows*. **Tulare Co.**, SNP, KCNP*. **Tehama Co.**, MeNF, Forks Ridge. **Mendocino Co.**, near Albion. Sheldon Creek. **Sonoma Co.**, Occidental. **Napa Co.**, Calistoga, Knights Valley, Yellow Jacket Ranch. **Marin Co.**, Point Reyes National Seashore*. **Santa Cruz Co.**, Big Basin Redwoods State Park. Santa Cruz, Empire Grade and McGivern Way. **Monterey Co.**, near Carmel*.

DESCRIPTION: **FRUIT BODY** 5–30 (45) cm across, up to 120 cm long, cushion- to hoof-shaped at first, becoming multitiered, columnar to cylindrical. One or two additional pore layers added each year. Specimens higher up on trunks are typically more columnar, whereas specimens lower on the trunk, or on large slash are typically more hoof-shaped. Surface dry, roughened, often cracking. Whitish on fresh growth, grayish brown to ochre, beige, tan, or light brown on older parts, sometimes greenish with algal growth. **PORES** very small, round to irregular. Fresh and living layers are white; older, inactive pores are pale beige-tan. **FLESH** thick, soft when fresh, soon corky, chalky or crumbly when dry or old. **ODOR**

indistinct to farinaceous, at time sour. **TASTE** very bitter. **SPORE DEPOSIT** whitish to creamy yellow. **MICROSCOPY:** **Spores** 6–9 x 3–4 μm , cylindrical, ellipsoid to ovoid, smooth, hyaline, inamyloid. **Basidia** 20–25 x 6–8 μm , clavate, 4-spored. **Cystidia** absent. **Hyphal system** dimitic. **Clamp connections** present.

ECOLOGY: Solitary or with a few scattered fruit bodies on trunks of living and dead conifers, typically fairly high up. Mostly fruiting on old trees, especially Douglas-fir, but will occur on other members of Pinaceae. Occasionally found on mid seral stage trees. Fruit bodies are perennial, very slow-growing and persisting for years (some for upwards of 80 years). Causing brown cubical heart rot of living conifer trunks. Ginns (2017) states the presence of a single fruit body 6 to 12 m from the ground indicates that about half of the heartwood has been decayed, and the presence of two (or more) fruit bodies indicates that the entire heartwood has been decayed.

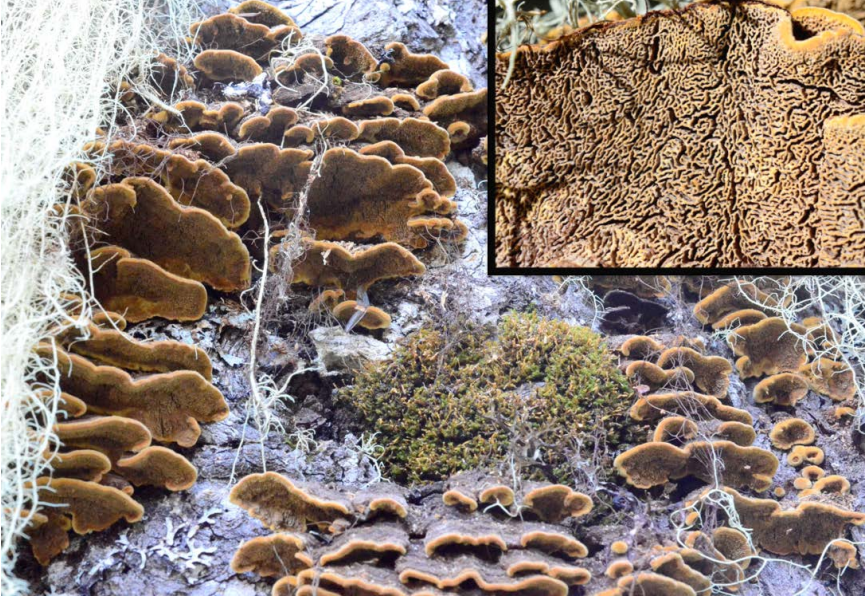
SIMILAR SPECIES: Younger specimens could be mistaken for *Fomitopsis pinicola*, which has tougher, woody (not corky) flesh, and often exhibits a three-tone cap (a pallid outer band, with a reddish band, and a dark brown to blackish older portion). *Ganoderma brownii* and *G. applanatum* can also have similar-shaped multitiered fruit bodies, but they have woody, brown flesh, brown-staining pores, and copious thick-walled, brown spores.

Porodaedalea cancriformans

(M.J. Larsen, Lombard & Aho) T. Wagner & M. Fisch

COMMON NAME:

SPECIES CODE:



FAMILY: Hymenochaetaceae

SYNONYMS: *Phellinus pini* var. *cancriformans* M.J. Larsen, Lombard & Aho, *Phellinus cancriformans* (M.J. Larsen, Lombard & Aho) M.J. Larsen & Lombard

SUMMARY: This species forms cankers on the trunks of fir (*Abies* spp.), and produces overlapping, or fused clusters of fruit bodies. The caps are dark brown to dark orange-brown with a mustard-brown growing margin, and brown, irregular to short maze-like pores. Currently known from 12 locations, three in California.

TAXONOMIC NOTES: First described as a variety of *Phellinus pini* (Larsen et al. 1979), then elevated to species rank in 1990 (Larsen & Cobb-Pouille). Phylogenetic analysis showed that it and allied species belonged in the genus *Porodaedalea* (Wagner & Fischer 2002). The North American *Porodaedalea* species form a species complex in which the species characteristics and the ecology of the taxa are not well known yet.

DISTRIBUTION: Occurring in the Klamath Mountains and southern Cascades in

California, containing north into Washington in the Cascades and into central Oregon in the Coast Range. Not recorded from British Columbia, Canada. Also reported from two sites in the Front Range of Colorado; these collections should be reexamined. **USA:** **CA:** Humboldt Co., SRNF, Grizzly Peak. SRNF, Horse Mountain. **Siskiyou Co.**, S-TNF, 16 km east of Mount Shasta. **OR:** 6 sites. **Jackson Co.**, Rogue River-Siskiyou National Forest, Willow Creek (Type). **WA:** 1 site. **CO:** 2 sites.

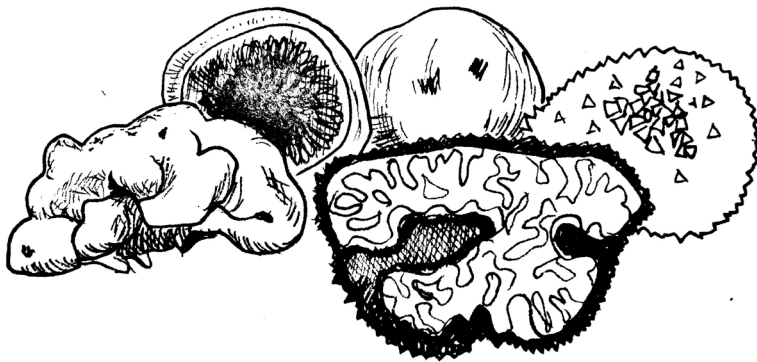
DESCRIPTION: **FRUIT BODY** growing in overlapping, or fused clusters on trunks of White Fir (*Abies concolor*). **CAP** 2–6 cm across, projecting up to 5 cm, conk-shaped, margin often incurved. Surface finely pubescent, often with concentric grooves. Dull dark brown to dark orangish brown, with a mustard-brown fresh growing margin. **PORES** small, rounded to irregular, more maze-like in age. Tube layer up to 0.7 cm thick. **FLESH** tough, woody. Dark brown, with a thin, blackish cuticle. **KOH** black on all parts. **MICROSCOPY:** **Spores** 4.5–5.5 x 3.5–4 µm, broadly ellipsoid, somewhat flattened, smooth, thick-walled, hyaline to pale yellow in KOH, inamyloid. **Basidia** unknown. **Hymenial setae** up to 50 µm long, x 13 µm, lanceolate, subulate to ventricose, short-blunt to mammilate. **Context skeletal hyphae** of unbranched, aseptate, parallel hyphae 3–5.5 µm wide. **Context generative hyphae** of parallel, thick-walled septate hyphae 2–4 µm wide. **Trama generative hyphae** 1.5–2 µm wide, branched, hyaline, septate.

ECOLOGY: Forming cankers on the trunks of fir (*Abies* spp), 1–8 m from base, and eventually fruiting from the wounded area. *Porodaedalea cancriformans* is a mild pathogen, causing flecked white pocket rot, and large cankered areas on living host, damaging the tree, and causing structural weakness. Fruit bodies appearing on mature fir trees, perennial, new growth typically in spring and fall.

SIMILAR SPECIES: *Porodaedalea* are a complex of poorly understood species in North America. Two European names have been misapplied to species occurring in western North America: The *P. 'pini'* complex typically is more shelf-like or bracket-like and rarely clustered. Besides the solitary shelf-like growth, it typically has a tomentose to hairy margin, and larger spores. Very similar is *P. 'chrysoloma'*. Many features overlap; distinguishing characteristics include thicker flesh on *P. chrysoloma*, narrower skeletal hyphae (2–4 µm wide, versus 3.5–7.5 µm for *P. pini*), and smaller setae (7–10 µm wide, versus 10–14 µm wide in *P. pini*). More work is needed to describe distinguishing features of North American species.

Photo: © Jeff Hitchcock, www.mushroomobserver.org.

SEQUESTRATE FUNGI



Amogaster viridiglebus

Castellano

ALT. NAME: *Lepiota viridigleba* (Castellano) Z.W. Ge & M.E. Sm.

COMMON NAME:

SPECIES CODE: LEV19



FAMILY: Agaricaceae

SYNONYM: See Taxonomic Notes

SUMMARY: A small, irregularly shaped to rounded, sequestrate fungus with a finely tomentose, whitish to pale greenish peridium, which stains reddish when fresh, a pale greenish gleba made up of round to irregular, empty locules, and a thin, dendroid columella. Microscopically, the ellipsoid, nearly round to somewhat spindle-shaped spores; some of which are dextrinoid in Melzer's reagent distinguish this species. Extremely rare; currently known from three sites. The type collection was made under *Populus* and conifers at Yuba Pass in TNF in 1987, and despite trying to relocate it several times since, it has not been found again at this location. A single fruit body was found dug up and partially eaten on a log in White and Red Fir (*Abies concolor*/*A. magnifica*) forest in S-TNF east of Mount Shasta in 2013. Multiple revisits every year since have failed to relocate it. This collection should be compared to the type collection. Trappe et al. (2009) reported a collection from Douglas Co. Oregon under Douglas-fir (*Pseudotsuga menziesii*). Ge & Smith (2013) stated that "subsequent examination of those specimens indicate that they are a different, and as yet undescribed, truffle species

(M. Castellano, personal communication)".

TAXONOMIC NOTES: Described by Castellano near Yuba Pass, Sierra County, California. Based on phylogenetic analysis (Ge & Smith 2013), it was shown that *Amogaster viridiglebus* is nested in *Lepiota*, section *Lepiota*, hence its transfer to the genus. For ease of field taxonomy, calling it *Amogaster viridiglebus* helps distinguish it from its epigeous relatives.

DISTRIBUTION: Known from the type location near Yuba Pass in Sierra County, and a presumed collection from S-TNF east of Mount Shasta. **USA: CA: Siskiyou Co.**, S-TNF, near Harris Spring. **Sierra Co.**, TNF, San Francisco State University Sierra Nevada Field Campus, near Yuba Pass (Type).

DESCRIPTION: **FRUIT BODY** up to 1.3 cm x 0.8 cm, rounded to irregular, rather soft. **PERIDIUM** thin, evanescent, dry, finely tomentose. White to pale green from underlying spore mass, bruising orange to pale red when fresh. **GLEBA** of small, round to irregular empty locules, whitish to pale green, pale to medium yellow when dried. **COLUMELLA** small, cartilaginous, dendroid when fresh, inconspicuous when dried. **RHIZOMORPHS** absent. **ODOR** indistinct. **TASTE** unknown. **MICROSCOPY:** **Spores** (9) 11–13.2 (15.2) x (4) 5.2–6.4 (7.6) μm , ellipsoid, amygdaliform to subfusiform, asymmetrical in side view, smooth, slightly thick-walled, pale yellowish brown in KOH, some spores deep red (dextrinoid) in Melzer's reagent, otherwise orange-brown. **Basidia** (10) 20–25 x (4) 6.4–8 μm , subcylindrical to narrowly clavate, hyaline, thin-walled, 4-spored. **Trama** 20–50 μm thick, of interwoven, thin-walled, hyaline hyphae, 1–2 μm broad; occasionally inflated to 6 μm broad. **Peridium** 20–30 μm thick, a single layer of loosely interwoven to somewhat parallel, thin-walled, colorless to brown hyphae, 1–2 μm broad. **Clamp connections** not observed.

ECOLOGY: Hypogeous, solitary or scattered, buried in duff or soil. Presumably saprotrophic; type collection near Yuba Pass was made under *Populus* and conifers. The Shasta-Trinity collection was in White and Red Fir (*Abies concolor*/*A. magnifica*) forest. Fruiting in late spring.

SIMILAR SPECIES: *Lepiota* (= *Cryptolepiota*) *mengei* also has reddish tones to the peridium, and a greenish colored gleba, but has subglobose to ovoid spores. It is known from southern California and Utah (under *Cercocarpus*).

Balsamia nigrans

Harkn.

COMMON NAME:

SPECIES CODE: BANI6



FAMILY: Helvellaceae

SYNONYMS: *Balsamia nigrescens* Harkn., *Pseudobalsamia nigrans* (Harkn.) Gilkey (as *Ps. nigrens*), *Pseudobalsamia nigrescens* (Harkn.) Gilkey, *Pseudobalsamia magnata* var. *nigrans* (Harkn.) Gilkey

SUMMARY: A small sequestrate fungus with a coarsely warted black exterior and firm, solid whitish gleba, marbled with white veins. Microscopically, the large, hyaline, oblong spores help distinguish it from all other similar species. Rare; currently known from 22 collections across 16 sites (Southworth et al. 2018), eight of which are in California, in southern California and in the Sierra Nevada and its foothills.

TAXONOMIC NOTES: This species was originally described as *Balsamia nigrens*, from Auburn, Placer County, California (Harkness 1899). This was later changed to *B. nigrans* to make it grammatically correct.

DISTRIBUTION: Occurring in disjunct populations from low- to mid-elevations in the southcentral to northcentral Sierra Nevada in California, and the Coast Range in Oregon. **USA: CA: Placer Co.**, near Auburn (Type). **Mariposa Co.**, Greely Hill

Road, near Highway 120. **Fresno Co.**, SieNF, Ross Creek Drainage, Turtle Creek. SieNF, Teakettle Natural Area. Four additional collections from unknown locations. **OR:** 7 sites.

DESCRIPTION: **FRUIT BODY** up to 4 cm across, and up to 2 cm tall, irregularly lobed to rounded, often centrally depressed, very firm. **PERIDIUM** dry, covered with coarse angular warts. Dark gray-black to black in color. **GLEBA** solid, white to pale grayish white, marbled with brighter white veins. **STIPE** absent. **RHIZOMORPHS** often with a fragile mycelial tuft, from a depression on underside. **ODOR** indistinct. **TASTE** indistinct. **MICROSCOPY:** **Spores** 22–29 x 10.5–15.5 μm , ellipsoid, thin-walled, smooth, containing one oil droplet. **Asci** 30 x 50 μm , saccate to ellipsoid, hyaline in KOH. **Gleba** containing the asci of densely interwoven, hyaline, thin-walled hyphae 3–4 μm wide. **Hyphae** lining the empty locules similar, 4–6 μm wide, typically brown in mass. **Peridium** up to 500 μm thick. **Peridium epicutis** up to 400 μm thick, of radial rows of sub-rectangular, readily separable cells, 8–18 x 10–40 μm , with thickened red-brown walls that often completely fill the cell. **Peridial subcutis** ~100 μm thick, of similar cells to the epicutis, but with thinner, yellow-brown walls.

ECOLOGY: Hypogeous, solitary, scattered, or sometimes clustered, buried in duff or soil. Presumed to be ectomycorrhizal, associated with Pinaceae; especially Douglas-fir (*Pseudotsuga menziesii*) and Jeffrey Pine (*Pinus jeffreyi*). Most collections come from low- to mid-elevation, with one site in the southern Sierra, made in high-elevation Red Fir (*Abies magnifica*) forest. It has also been found under oak (*Quercus* spp.)

SIMILAR SPECIES: Other *Balsamia* species look similar but lack the black peridium. *Leucangium carthusianum* has a rounded to slightly irregular fruit body, with a finely warted, dark grayish green to black peridium, and a whitish gleba which matures grayish, olive to brownish, marbled with whitish to pale buff veins. Microscopically, it has large, smooth, lemon-shaped to spindle-shaped spores.

Photo: © Michael Castellano.

Choiromyces alveolatus

(Harkn.) Trappe

COMMON NAME:

SPECIES CODE: CHAL23



FAMILY: Tuberaceae

SYNONYMS: *Piersonia alveolata* Harkn., *Choiromyces cookei* Gilkey, *Hydnobolites excavata* Harkn., *Piersonia bispora* Gilkey, *Piersonia scabrosa* Harkn.

SUMMARY: A sequestrate fungus with a firm, rounded to irregularly shaped fruit body with a pinkish buff to brownish peridium, and a creamy yellow, peach-orange to pale ochre gleba, marbled with whitish veins. Microscopically, the large (22–36 μm) globose spores, which resemble golf balls help distinguish *Choiromyces alveolatus*. It also has a strong, complex ‘truffly’ odor. Widespread, but uncommon in California; occurring from near sea-level to subalpine forests. Fruiting from early spring into fall; most common in spring; typically buried quite deep in mineral soil.

TAXONOMIC NOTES: Described by Harkness (1899) from near Auburn, Placer County, California.

DISTRIBUTION: Widespread in western North America, but rarely collected. Known from the Central Coast in California, and the Sierra Nevada and Cascade Range north into Oregon, with single sites in Washington, Utah, Wyoming and Idaho.

USA: **CA:** Siskiyou Co., KNF, Ball Mountain. KNF, Carter Meadows Summit. KNF, Martin's Dairy. S-TNF, Mount Shasta, Red Fir Flat. West Fork of Beaver Creek. **Plumas Co.**, LNF, Swain Mountain Experimental Forest. LNF, Jennie Springs. **Sierra Co.**, TNF, San Francisco State University Sierra Nevada Field Campus. TNF, Yuba Pass. TNF, Green Acres near Bassett's Station. TNF, Sand Pond on Gold Lake Road. **Placer Co.**, Auburn (Type). **Alameda Co.**, University of California, Berkeley campus. **Monterey Co.**, UC Big Creek Reserve. Unknown, two additional collections without location data. **OR:** 9 sites. **WA:** 1 site. **ID:** 1 site. **WY:** 1 site. **UT:** 1 site.

DESCRIPTION: **FRUIT BODY** 1.5–5 cm across, 1–3.5 cm high, rounded to irregularly lobed, very firm. **PERIDIUM** tan, pinkish brown to pale brown, unchanging or becoming slightly darker, pink-brown in age. **GLEBA** firm, slightly corky in texture, solid when young, made up of creamy yellow, peach-orange to pale ochre, irregular, small open chambers when mature, intermixed with whitish veins and translucent columella. **COLUMELLA** translucent-white, radiating out from central point with fine veins. **ODOR** very strong, 'truffly', a complex mix of garlic and stinky cheese, with a chemical undertone. **TASTE** unknown. **MICROSCOPY:** **Spores** 22–36 μm broad, globose, covered with dimples (resembling a golf ball), hyaline to pale brownish, with a dark spot. **Asci** (1- to) 4-spored, clustered, club-shaped to deformed, with a long pedicel, 80–104 x 64–72 μm . **Paraphyses** interspersed with asci, typically clustered, with swollen tips. **Outer cortical hyphae** branched and intermingled, often projecting from surface, forming hairs; structure beneath becoming twisted, made up of distinctly angled cells, to 20- μm wide, gradually becoming smaller, changing to subcortical structure of compactly arranged, sometimes connected hyphae running parallel to surface.

ECOLOGY: Hypogeous, solitary or scattered in 'nests,' usually buried quite deep in the mineral soil. Ectomycorrhizal, growing with Pinaceae, especially Red Fir (*Abies magnifica*). Fruiting from soon after snow-melt in early spring, through summer, or into fall.

SIMILAR SPECIES: *Tuber* species have solid, whitish to brownish gleba, marbled with paler veils, and distinctly spiny or reticulate spores.

Destuntzia rubra

(Harkn.) Fogel & Trappe

COMMON NAME:

SPECIES CODE: DERU7



FAMILY: Gomphaceae

SYNONYMS: *Hymenogaster ruber* Harkn.

SUMMARY: A sequestrate fungus with a rounded to irregular fruit body, a whitish peridium that stains bluish purple and then rosy pink, a grayish olive gleba marbled with whitish veins, and a fishy odor. Known from 14 sites in Oregon and California; eight of these records are greater than 30 years old, and no specimens have been recollected from these sites, despite continued surveys for them.

TAXONOMIC NOTES: First described by Harkness (1899) as *Hymenogaster ruber* from Mill Valley, Marin County, California. Fogel and Trappe (1985) made *Destuntzia rubra* the type of *Destuntzia*.

DISTRIBUTION: Most sites are on the northern California coast and in the Coast Range, with one site in the northern Sierra Nevada, and one site in central Oregon.

USA: **CA:** **Del Norte Co.**, 2 miles south of Smith River. **Humboldt Co.**, 9 miles southeast of Blue Lake, junction of Maple Creek Rd. & Simpson Rd. **Mendocino Co.**, Jackson State Forest, Woodlands Camp on hill above Camp 1 Mess Hall. Jackson State Forest, along Road 409. Jackson State Forest, on south side of

Highway 20, at mile 9.3. Jackson State Forest, Road 800, 0.5 mi southwest of Highway 20. **Marin Co.**, Mill Valley (Type). Mt Tamalpais. Mt Tamalpais State Park, Bootjack Campground. Mill Valley, Blythedale Canyon. **Santa Cruz Co.**, University of California Santa Cruz Campus, Marshall Fields. **Sierra Co.**, TNF, Wild Plum Campground. **OR:** 1 site.

DESCRIPTION: FRUIT BODY 1–2.5 cm across, rounded to kidney-shaped, occasionally irregular. Surface dry, pubescent, often with adhering soil. White at first, developing deep pink tones from the top down. Quickly staining bluish purple, then rosy pink when handled. **GLEBA** composed of dark grayish yellow, gray-olive, or olive-brown, rounded locules marbled with whitish veins. Rather firm; locules with spores embedded in gelatinous matrix. **COLUMELLA** absent, or top-shaped with a few radiating veins. **RHIZOMORPHS** basal, concolorous with peridium. **CHEMICAL REACTIONS:** **KOH** dark brown on exterior, yellow-brown on interior of peridium, **ETOH** deep red, **FeSO₄** negative. **ODOR** Fishy, quite strong when mature. **TASTE** unknown. **MICROSCOPY:** **Spores** 8–11 x 7–9 μm , including ornamentation, subglobose to ellipsoid, ornamented with conical, vertically striate warts 0.5–2 μm high, <1.5 μm broad, thin-walled, base truncate, pale olive in **KOH**, immature spores hyaline. **Basidia** 40–50 x 4–8 μm , cylindrical to clavate, projecting into locules, hyaline, 1-spored. **Peridium** 875–1500 μm thick, two-layered. **Epicutis** 250–470 μm thick, tightly interwoven, hyaline, thin-walled hyphae 2–4 μm broad. **Subcutis** 625–1030 μm thick, confluent with trama, of tightly interwoven, hyaline, thin-walled hyphae 3–4 μm broad at septa, inflated to 10 μm broad. A zone of irregular, interwoven, thick-walled nonseptate hyphae 4–12 (18) μm broad occurs at the junction of the epicutis and subcutis. Associated with the thick-walled hyaline hyphae, thick-walled rounded to ellipsoid cells 29–54 x 22–48 μm . **Clamp connections** abundant.

ECOLOGY: Hypogeous, scattered, or in clusters in forests with Douglas-fir (*Pseudotsuga menziesii*). Most collections are in drier coastal forest in northern California. Ectomycorrhizal, associated with mature and old Douglas-firs. Fruiting from spring into mid-summer, and early fall into winter.

SIMILAR SPECIES: *Destuntzia saylorii* is very similar, has a yellow-brown gleba, with yellowish veins, smaller one-spored basidia and much smaller spores (5–8 x 5–6.5 μm). Some *Rhizopogon* species stain pink and often have rhizomorphs around much of the exterior of a thin peridium, but have a denser, sponge-like gleba, and smooth, thin-walled, oblong to ellipsoid spores.

Destuntzia saylorii

Fogel & Trappe

COMMON NAME:

SPECIES CODE:



FAMILY: Gomphaceae

SYNONYMS: None

SUMMARY: A small sequestrate fungus with rounded to irregularly shaped fruit bodies with a whitish peridium that stains pink, a yellow-brown gleba marbled with yellowish veins, single-spored basidia, and small, warted spores. Known from three locations; one in Tahoe National Forest, and two in San Bernardino National Forest.

TAXONOMIC NOTES: Described by Fogel and Trappe (1985) from Tahoe National Forest, Sierra County, California.

DISTRIBUTION: Very rare, known from only three locations, one in the northern Sierra Nevada, two in the San Bernardino mountains. **USA: CA: Sierra Co.,** TNF, Wild Plum Campground (Type). **Riverside Co.,** SBNF, North Fork of San Jacinto River. SBNF, Fern Basin Campground.

DESCRIPTION: **FRUIT BODY** 1–1.5 (2) cm across, rounded to kidney-shaped, occasionally irregular. **PERIDIUM** dry, pubescent, often with adhering soil. White at first, staining pink to pinkish purple. **GLEBA** dark yellow-brown, locules rounded,

marbled in between with yellowish veins. Rather firm, locules with gel-embedded spores. **COLUMELLA** absent. **RHIZOMORPHS** single, basal, concolorous with peridium. **CHEMICAL REACTIONS:** Unknown. **ODOR** unknown. **TASTE** unknown. **MICROSCOPY:** **Spores** 5–8 x 5–6.5 μm , including ornamentation, subglobose to broadly ellipsoid, ornamented with warts up to 0.5 μm long, walls moderately thick, strongly yellow in KOH. Pedicel central, tubular, hyaline, 1–3 x 1.5–2 μm broad. **Basidia** 12–14 x 4 μm , subcylindrical to obclavate, hyaline, 1-spored. **Peridium** 400–600 μm thick, two-layered. **Epicutis** 50- μm thick, consisting of parallel, hyaline, thin-walled hyphae 3–6 μm broad. **Subcutis** 350–550 μm thick, confluent with trama, consisting of interwoven, hyaline, thin-walled hyphae 3–4 μm broad at septa, inflated to 12- μm broad. **Clamp connections** present.

ECOLOGY: Hypogeous, scattered or in clusters in duff and soil in forests with Douglas-fir (*Pseudotsuga menziesii*), White Alder (*Alnus rhombifolia*), Incense Cedar (*Calocedrus decurrens*), and oaks (*Quercus* spp). All collections were growing along stream banks. Fruiting from late spring into fall. Presumably ectomycorrhizal, but host species uncertain.

SIMILAR SPECIES: The small, hypogeous, sequestrate fruit bodies, whitish peridium that stains rosy pink, dark yellow-brown gleba marbled with yellowish veins, single-spored basidia and small, warted spores help set this species apart. *Des-tuntzia rubra* is similar, but has a thicker peridium, as well as larger basidia and spores. Pink-staining species of *Rhizopogon* often have multiple rhizomorphs on the exterior of a thin peridium, and a firm, homogenous, more densely sponge-like gleba.

Photo: © Michael Wood.

Elaphomyces subviscidus

(Zeller) Trappe & Guzmán

COMMON NAME:

SPECIES CODE: ELSU4



FAMILY: Elaphomycetaceae

SYNONYMS: *Scleroderma subviscidum* Zeller

SUMMARY: A small to medium-size hypogeous fungus with a whitish to graying peridium that is smooth under binding soil, a somewhat thick peridium and powdery gleba help distinguish this species. Extremely rare; currently only known from three sites in Oregon and one in Idaho. Although it has not been reported from California, efforts should be made to locate it in high-elevation Lodgepole Pine and Mountain Hemlock forest.

TAXONOMIC NOTES: Described as *Scleroderma subviscidum* by Zeller (1947) from Jackson County, Oregon. Later transferred to *Elaphomyces* by Trappe and Guzmán (1971). The Colorado collection was made under Ponderosa Pine (*Pinus ponderosa*) and Douglas-fir (*Pseudotsuga menziesii*) and has substantially larger spores; more investigation is warranted, as these may pertain to a distinct species. Most western North American species of *Elaphomyces* are either known by European names, or do not have any species name attached to them; work is under way resolving this.

DISTRIBUTION: Extremely rare, known from three locations in high-elevation forest

in the Oregon Cascades and Coast Range, and reported from single sites in Idaho, Utah and Colorado. **USA: OR:** 3 sites. **Jackson Co.**, near Prospect (Type). **ID:** 1 site. **UT:** 1 site. **CO:** 1 site.

DESCRIPTION: **FRUIT BODY** up to 5 cm x 3 cm, nearly round, squat, firm. **PERIDIUM** white to grayish, drying yellowish. Often encrusted with soil held by inconspicuous, but abundant, pale yellowish hyphae; smooth if the soil is rubbed off. Peridium 0.2–0.3 cm thick, with a thin, pale yellow outer layer, and a thick, white to light gray inner layer. **GLEBA** a powdery spore mass with sparse hyphal threads; dark brown to nearly black. **STIPE** absent. **RHIZOMORPHS** absent. **ODOR** like onions. **TASTE** not sampled. **MICROSCOPY:** **Spores** globose, 12–21 μm broad excluding ornamentation, 14–24 μm broad including ornamentation, covered with crowded spines, 1–2 μm long; separated by 0.2–0.5 μm , sometimes two or three spines are joined to form short ridges, but not forming a partial reticulum. Ornamentation is often embedded in an inconspicuous, gelatinous matrix. Smaller spores with moderately thick walls, and dark brown in color; larger spores pale brown, and thin-walled; all containing a large round oil droplet. **Asci** unknown, (“not observed” in type description), spores are often in spherical clusters of eight. **Gleba hyphae** dispersed among spores, mostly 1.5–3 (6) μm wide, thin-walled, colorless to pale yellowish brown, with scattered, dark brown, amorphous deposits between hyphae. **Peridium epicutis** ~150 μm thick, of densely interwoven, single to bundled hyphae 3–5 μm wide; walls mostly thin and colorless, thickened to 0.5 μm in areas, and often yellowish. The entire layer obscured by colorless to yellowish amorphous debris. Emerging, soil-binding hyphae thin-walled, colorless, 2.5–4 μm wide. **Peridium subcutis** ~2,500 μm thick, circumferentially aligned and interwoven fascicles of a few to many, colorless, highly refractive hyphae, 4–8 μm wide, with gelatinous-thickened walls, nearly filling the cells, and with yellowish amorphous debris scattered throughout.

ECOLOGY: Hypogeous, solitary or scattered in duff or soil under Lodgepole Pine (*Pinus contorta*), Western Hemlock (*Tsuga heterophylla*), and Mountain Hemlock (*Tsuga mertensiana*). Ectomycorrhizal. The type collection was exposed (“above ground on decayed granite soil”). Fruiting in late spring and summer. Most *Elaphomyces* species fruit bodies are long-lasting. If this is the case with this species, it could potentially be found from early spring into late fall.

SIMILAR SPECIES: Members of the *Elaphomyces granulatus* group have a granulated to warty peridium, and larger spores. The *Elaphomyces muricatus* group has a warty to pimply exterior peridium and is distinctly marbled in cross-section.

Photo: © Michael Castellano.

Fevansia aurantiaca

Trappe & Castellano

COMMON NAME:

SPECIES CODE: FEAU4



FAMILY: Albatrellaceae

SYNONYMS: None

SUMMARY: A small, hypogeous, sequestrate fungus with a pale orange to orange-brown peridium, and sticky, pale pink-orange to orange-brown gleba, made up of round locules filled with a gelatinized spore mass. Microscopically, the thin-walled, fusoid spores and extracellular deposits of orange to bright red pigment on the subcutis and trama characterize *Fevansia aurantiaca*.

TAXONOMIC NOTES: Described by Trappe and Castellano (2000) from Devils Lake, Deschutes National Forest, Oregon.

DISTRIBUTION: Extremely rare, known from a single collection in California, in the southern Sierra Nevada; 12 additional collections have been made in the Oregon Cascades, three from the Rocky Mountains in Colorado, and one from Bitterroot Mountains in Idaho. **USA:** **CA:** Fresno Co., SieNF, near Huntington Lake. **OR:** 4 sites. **Deschutes Co.,** Deschutes National Forest, Devils Lake (Type). **ID:** 1 site. **CO:** 3 sites.

DESCRIPTION: **FRUIT BODY** 1.5–2.5 cm across, nearly round to lobed, firm. **PE-**

RIDIUM pale brown, orange-brown to orange, often with adhering soil and debris. **GLEBA** firm, gelatinous, often sticky, pale pink-orange to orange-brown overall. Locules round, ~1 mm across, filled with gelatinized, pale yellow to pale brownish yellow spore mass. Trama orange to orange-brown. **COLUMELLA** absent, but often with columella-like veins through gleba, concolorous with trama. **STIPE** absent. **RHIZOMORPHS** absent. **ODOR** indistinct to strong, oily-fruity. **TASTE** unknown. **MICROSCOPY: Spores** 10–13 x (3.5) 4–5 μm fusoid, thin-walled, smooth, hyaline singly in KOH, gray-yellow in mass, inamyloid, cyanophilic. **Basidia** unknown. **Trama** with a narrow, central strand of hyaline, interwoven, thin-walled hyphae, 1.5–5 μm wide. The broad zone between central strand and locules made of hyaline, thin-walled hyphae with most cells inflated to 6–20 μm wide, with extracellular deposits of amorphous orange pigment. **Peridium** 100–200 μm thick. **Peridium epicutis** ~ 25 μm thick, of appressed, thin-walled, hyaline (with pale olive-yellow to orange contents) hyphae, 1.5–4 μm wide. **Subcutis** 75–175 μm thick, of interwoven, hyaline, thin-walled hyphae 1.5–5 μm wide at septa; cells occasionally inflated to 5–10 μm wide. With scattered, extracellular deposits of amorphous orange pigment in KOH when young, and with massive extracellular deposits of orange to bright red pigment when mature. Pigment dissolving into yellow to orange pigment globules in Melzer's reagent. **Clamp connections** absent.

ECOLOGY: Hypogeous, solitary or scattered in duff or soil. Ectomycorrhizal, occurring under fir (*Abies* spp.), and Mountain Hemlock (*Tsuga mertensiana*); associated with old-growth forests. Fruiting in summer and early fall.

SIMILAR SPECIES: *Leucogaster rubescens* has a whitish, orange-red to brick red peridium and white gleba with rounded locules, and globose to subglobose, alveolate-reticulate spiny spores. Other *Leucogaster* species lack the orange colors of *Fevansia aurantiaca*, and have globose to ovoid, spiny-reticulate spores. *Rhizopogon alexsmithii* (= *Alpova alexsmithii*) has a yellowish brown to dark brown peridium, a sticky, gelatinous yellowish pink gleba, and small ellipsoid spores, 5–8 x 3–4 (5) μm .

Photo: © Scot Loring.

Genea gardneri

Gilkey

COMMON NAME:

SPECIES CODE:



FAMILY: Pyronemataceae

SYNONYMS: None

SUMMARY: *Genea gardneri* is a small, black, hypogeous, sequestrate fungus, with a wrinkled and folded fruit body with a warty surface. It has a black, convoluted interior with irregular hollows, and whitish to grayish flesh in the walls. Microscopically, the large, broadly ellipsoid to nearly globose spores, with broad, low, rounded warts help distinguish it. Currently known from 17 sites in California, and 11 additional sites in Oregon. The hypogeous growth and dull colors make it rather inconspicuous, and it may be more common than currently thought.

TAXONOMIC NOTES: Described by Gilkey (1916) from Piedmont Park, Oakland, California. The western North American *Genea gardneri* may be conspecific with the European *Genea sphaerica*.

DISTRIBUTION: Widespread in coastal and foothill forest, from southern California into Oregon. Currently known from 17 sites in California, and 11 in Oregon. **USA:** **CA:** **Sierra Co.**, TNF, Wild Plum Campground. **Yuba Co.**, UC Sierra Research and Extension Center. **Marin Co.**, San Rafael. **Napa Co.**, Location unknown.

Sonoma Co., Hood Mountain County Park. **Alameda Co.**, Oakland, Mountain View Cemetery. Oakland, Piedmont Park (Type). Berkeley, Strawberry Canyon. University of California Berkeley campus. **Santa Clara Co.**, Alma. Quicksilver Park. **Santa Cruz Co.**, University of California Santa Cruz campus. **Monterey Co.**, Hastings Natural History Reservation, Finch Creek. **Riverside Co.**, San Jacinto Mountains, Alvin Meadow. San Jacinto Mountains, McMullen Flats. **Los Angeles Co.**, Angeles National Forest, Prospect Campground. San Gabriel Mountains, Charlton Flat. **OR:** 11 sites.

DESCRIPTION: FRUIT BODY 1–1.5 cm across, rounded, typically wrinkled, lobed and folded, often with an opening to an internal cavity. Peridium finely warted, black in color. **INTERIOR** quite convoluted from infolding of walls, with hollow chambers. Chambers of similar color and texture to exterior; flesh of walls whitish to grayish. **STIPE** absent, often only a tuft of brown mycelium. **ODOR** indistinct to slightly garlicky. **TASTE** indistinct. **MICROSCOPY: Spores** 32–36 x 28–34 μm , broadly ellipsoid to nearly round, ornamented with broad, low, rounded warts that dissolve in KOH, often appearing pitted when mature. **Asci** unknown. **Paraphyses** slender, septate, uniting beyond the asci. **Peridium** outer layer of twisted, thick-walled, large dark cells, becoming small, thin-walled, and colorless inward.

ECOLOGY: Hypogeous, solitary or scattered, buried under leaves, in duff or soil, ectomycorrhizal. Most collections come from forest or woodlands with oaks (*Quercus* spp.). Also with Douglas-fir (*Pseudotsuga menziesii*), and Pacific Madrone (*Arbutus menziesii*). Fruiting from late winter into early fall; winter and early spring specimens typically don't have mature spores.

SIMILAR SPECIES: Members of the *Genea harknessii* complex have similar fruit bodies that are usually slightly larger, and dark brown to blackish. The spores are slightly smaller, 24–28 x 22–27 μm , and are smooth when immature, becoming finely warty with pointed warts when mature. *Genea bihymeniata*, which so far is only known from southern California, is also very similar to *Genea gardneri* macroscopically, but has smaller spores, 22–25 (28) x (20) 21–24 μm .

Photo: © Michael Castellano.

Genea harknessii

Gilkey

COMMON NAME:

SPECIES CODE:



FAMILY: Pyronemataceae

SYNONYMS: None

SUMMARY: *Genea harknessii* has small, dark brown, dark reddish brown to blackish, wrinkled and folded hypogeous, sequestrate fruit bodies with a warted surface. The interior is convoluted with irregular hollows from in-folded and lobed walls, with a similar color and texture to the exterior. The thin, fragile walls have whitish to grayish flesh. Microscopically, it has large, broadly ellipsoid to nearly round, sparsely ornamented spores with pointed to irregular protrusions at the tips. Currently known from 10 sites in California, and an additional ~25 sites in the Pacific Northwest.

TAXONOMIC NOTES: Described by Gilkey (1916), from Strawberry Canyon, Berkeley, California. Molecular phylogenetic studies by Smith et al. (2006) suggested the possibility of five cryptic phylogenetic species in the *Genea harknessii* complex. Smith et al. (2006) stated; “Despite significant diversity in the ITS, mature ascomata from three of the *G. harknessii* lineages could not be morphologically differentiated”. For the purpose of this publication, the complex is considered a single entity.

DISTRIBUTION: Widespread in coastal, foothill and montane forest, from central California into Washington. Currently known from 10 sites in California, 20-plus in Oregon, and 2 in Washington. **USA: CA: Sierra Co.,** TNF, Wild Plum Campground. TNF, Yuba Pass. **Yuba Co.,** Sierra Foothill Research and Extension Center. **Tulare Co.,** SNP. **Mendocino Co.,** Caspar. **Sonoma Co.,** Annadel State Park. **Alameda Co.,** Berkeley, Strawberry Canyon (Type). **San Mateo Co.,** “Redwood Park”. **Santa Clara Co.,** Guadalupe Mines. **Santa Cruz Co.,** Santa Cruz Mountains near Wrights Station. **OR:** 20+ sites. **WA:** 2 sites.

DESCRIPTION: **FRUIT BODY** 0.5–2.5 cm across, rounded, typically wrinkled, lobed and folded, often centrally depressed, with an opening to an internal cavity. Peridium finely warted, dark brown, dark reddish brown to blackish. **INTERIOR** quite convoluted from infolding of walls, with hollow chambers. Chambers of similar color and texture to exterior, flesh of walls whitish to grayish. **STIPE** absent, often only a tuft of brown mycelium. **ODOR** indistinct to slightly garlicky. **TASTE** indistinct. **MICROSCOPY:** **Spores** 24–32 x 21–29 μm , broadly ellipsoid to subglobose, appearing smooth when immature, ornamented with sparse pointed to irregular protrusions at tips when mature. **Asci** cylindric to slightly clavate, loosely enclosing the spores.

ECOLOGY: Hypogeous, solitary or scattered, buried under leaves, in duff or soil. Ectomycorrhizal; most collections come from forest or woodlands with oaks (*Quercus* spp.). Also with Douglas-fir (*Pseudotsuga menziesii*), fir (*Abies* spp.), and Pacific Madrone (*Arbutus menziesii*). Fruiting from late fall into early summer; winter and early spring specimens typically don’t have mature spores.

SIMILAR SPECIES: *Genea gardneri* is generally slightly smaller and has darker black colors. Microscopically, it has broadly ellipsoid to subglobose spores ornamented with broad, low, rounded wart, appearing pitted in age. Paler specimens can easily be distinguished from *G. harknessii* by the larger spores, measuring 32–36 x 28–34 μm . *Genea bilymeniata*, which so far is only known from Riverside County in southern California, is also very similar, but typically slightly darker and more convoluted; it is also an oak associate. The spores are ornamented with crowded, rounded warts, and are slightly smaller than in *G. harknessii*, measuring 22–25 (28) x (20) 21–24 μm .

Gymnomyces subalpinus

(A.H. Sm.) Trappe, T. Lebel & Castellano

ALT. NAME: *Russula orsonmilleri* Trappe and T.F. Elliot

COMMON NAME:

SPECIES CODE:



FAMILY: Russulaceae

SYNONYMS: *Martellia subalpina* A.H. Sm.

SUMMARY: *Gymnomyces subalpinus* is a small to medium-sized, hypogeous, sequestrate fungus, likely restricted to mature and old-growth fir forests. Recognized by its white to yellowish or cinnamon-buff peridium, which slowly stains dingy cinnamon to tan, a soft, white to pale tan gleba, with dull brown stains in age, and small irregular to rounded open locules. Microscopically, the strongly amyloid, globose to subglobose spores, ornamented with a broken reticulum, the 2-spored basidia, pockets of sphaerocysts under the peridium, and lack of oleiferous or laticiferous (latex bearing or transferring) hyphae in the trama help distinguish this species. Currently known from five sites; one in Idaho, two in Oregon and two in California. There were 14 collections made at one of the California sites (Swain Mountain) in July and August of 1994. Attempts should be made to locate other sites in the area.

TAXONOMIC NOTES: Described by Smith (1963) as *Martellia subalpina* from near McCall, Idaho, transferred to the genus *Gymnomyces* by Trappe et al. (2002), later transferred into *Russula* (Elliott & Trappe 2018). *Gymnomyces* species are notori-

ously hard to identify, requiring diligent microscopic examination, and occasionally, a DNA sequence. Anything closely matching the description stated here should be collected. For ease of field taxonomy, calling it *Gymnomyces subalpinus* helps distinguish it from its epigeous russula relatives.

DISTRIBUTION: Rare; known from four locations in the southern Cascades in California and Oregon, and a single location in Idaho. **USA:** **CA:** Siskiyou Co., S-TNF, near Harris Spring. **Plumas Co.**, LNF, Swain Mountain Experimental Forest. **OR:** Klamath Co., Mount Scott trailhead. Location unknown. **ID:** Valley Co., Payette National Forest, Brundage Mountain near McCall (Type).

DESCRIPTION: **FRUIT BODY** 1–3.5 cm across, rounded to irregular, soft. **PERIDIUM** dull white to yellowish or cinnamon-buff, slowly staining dingy cinnamon to tan, or discoloring so in age. Surface smooth, unpolished. **GLEBA** soft, with small rounded to irregular open locules. White when young, becoming pale tan, with dull brown stains in age. Columella rudimentary, dendroid, white. **STIPE** absent, base often with rhizomorphs. **ODOR** indistinct. **TASTE** mild. **CHEMICAL REACTIONS:** No reactions to KOH or FeSO₄. **MICROSCOPY:** **Spores** 8–10 (11) x 7.5–10 (11) μm, globose to subglobose; ornamentation strongly amyloid, forming a broken reticulum 0.2–0.4 μm high; wall inamyloid but almost obscured by the ornamentation. **Basidia** 24–36 x 9–11 μm, 2-spored (rarely 4-spored), clavate, thin-walled, hyaline in KOH. **Cystidia** absent. **Subhymenium** of isodiametric cells two–three deep. **Trama** of interwoven, thin-walled, hyaline hyphae 6–10 μm wide. No oleiferous or laticiferous hyphae observed. **Peridium epicutis** a poorly formed turf of subcylindric, fusoid-ventricose to clavate, thin-walled, hyaline terminal cells 20–36 x 5–9 μm. **Peridium subcutis** ~100 μm thick, of compactly interwoven, non-gelatinous, hyaline hyphae, 2–7 μm wide, with pockets of sphaerocysts scattered under this layer. **Clamp connections** absent.

ECOLOGY: Hypogeous, solitary or scattered, buried in duff or soil. Ectomycorrhizal; most collections come from mid- to high-elevation, mature and old-growth fir (*Abies* spp.) forests. Fruiting in summer and fall.

SIMILAR SPECIES: A number of gymnomycetes closely resemble this species. Habitat, color, and color change of the peridium and gleba, spore size and shape, spore ornamentation (height and composition), number of spores per basidium, and presence or absence of sphaerocysts, oleiferous or laticiferous hyphae need to be observed.

Photo: US Forest Service/Daniel Nicholson.

Gymnomyces xerophilus

M.E. Sm. & Trappe

ALT. NAME: *Russula xerophila* (M.E. Sm. & Trappe) Trappe & T.F. Elliott

COMMON NAME:

SPECIES CODE:



FAMILY: Russulaceae

SYNONYMS: None

SUMMARY: A small to medium sized, hypogeous, sequestrate fungus, growing with oaks (*Quercus* spp.). Recognized by its white to pale yellow peridium, with yellow to brownish stains in age. The gleba is white to creamy young when young, maturing light orange-yellow; made up of tightly packed, small irregular, maze-like open locules. It has large, strongly amyloid spores ornamented with warts and rods, 0.3–1 μm tall, connected by short ridges forming a partial to complete reticulum.

TAXONOMIC NOTES: Described by Smith et al. (2006) from Yuba County, California, at the Sierra Foothill Research and Extension Center. Sequestrate *Russula* species have been traditionally described in the genera *Gymnomyces*, *Martellia* or *Elasmomyces*. However the fruiting body type has apparently evolved multiple times within the genus *Russula*, and all species have been formally transferred to *Russula* when appropriate (Trappe & Elliott 2018).

DISTRIBUTION: Currently known from four collections, from two locations in the northern Sierra Nevada foothills 'oak zone'. Although similar habitat exists on

the on the western (drier) side of the valley, no surveys have been conducted in the oak zone of this area. **USA: CA: Yuba Co.**, Sierra Foothill Research and Extension Center. **El Dorado Co.**, 3 miles north of Cool, on Highway 49.

DESCRIPTION: **FRUIT BODY** 1.2–2 cm across, 0.4–3 cm tall, rounded to irregular, firm when young, soft in age. **PERIDIUM** smooth, thin, not readily separable from gleba. White when young, becoming yellowish white to pale yellow, with scattered yellow to brown spots when mature. **GLEBA** dry, with tiny to small maze-like, open locules, 0.2–3 x 0.1–3 mm, occasionally with whitish sterile veins in center, and white sterile tissue near peridium; lacking a true columella. White to cream when young, soon becoming pale orange-yellow to light orange-yellow. **STIPE** absent. **ODOR** indistinct. **TASTE** unknown. **MICROSCOPY:** **Spores** 11–13 (15) x (10) 11–13 μm (excluding ornamentation), globose to subglobose, walls thick, ornamented when young with isolated warts and rods, 0.3–1 μm tall, as spores mature, rods are gradually joined by ridges 0.3 μm tall to form a partial to complete reticulum (with some rods and warts remaining isolated). Pale golden yellow singly, golden yellow in mass in KOH. In Melzer's reagent, spore walls smoky brown, ridges strongly amyloid, the warts and rods erratically covered with strongly amyloid spots at tips or on sides; sterigma appendage weakly amyloid, plage absent. **Basidia** 35–42 x 9–11 (12) μm , clavate, 2- or 4-spored, sterigmata 5–8 x 1 μm . **Cystidia** absent. **Subhymenium** of two or three rows of spherical cells 5–12 (20) μm wide. **Trama** 15–20 μm across, of subparallel hyphae 2–5 μm wide, with occasional cells inflated up to 10 μm ; sphaerocysts absent. **Peridium** 150–200 μm thick. **Peridium epicutis** a prosenchyma (twisted and fused hyphae) of tightly packed, hyaline, thin-walled hyphae (1.5) 3–5 μm wide, some cells inflated up to 10 μm . Occasionally with scattered, short, projecting hyphal tips forming a trichodermial suprapellis. **Subcutis** of subparallel, hyaline, thin-walled hyphae 1.5–4 μm wide; occasionally cells inflated up to 10 μm . Refractive (oleiferous) hyphae present, but rare, 2–3 μm wide. **Clamp connections** absent.

ECOLOGY: Hypogeous, solitary or scattered, buried in duff or soil. Ectomycorrhizal, associated with Blue Oak (*Quercus douglasii*), Interior Live Oak (*Q. wislizeni*), and Black Oak (*Q. kelloggii*), possibly with other *Quercus* species. Fruiting in spring.

SIMILAR SPECIES: A number of *Gymnomyces* species closely resemble this taxon. Habitat, color, and color changes to the peridium and gleba, spore size and shape, spore ornamentation, number of spores per basidium, and presence or absence of sphaerocysts and oleiferous or laticiferous hyphae need to be observed. A key to oak-associated *Gymnomyces* can be found in Smith et al. (2006).

Photo: © Matthew E. Smith.

Hydnotryopsis setchellii

Gilkey

COMMON NAME:

SPECIES CODE:



FAMILY: Pezizaceae

SYNONYMS: *Choiromyces setchellii* (Gilkey) Gilkey, *Choiromyces ellipsosporus* Gilkey (as *Choeromyces ellipsosporus*)

SUMMARY: An extremely rare and poorly known species; *Hydnotryopsis setchellii* can be recognized by the hypogeous habit, firm, irregularly lobed to elongated, sequestrate fruit body, silver-white to yellowish peridium, and solid yellowish gleba with paler meandering veins. Microscopically the ascus tips turn blue (amyloid) in Melzer's reagent, and it has subglobose to broadly ellipsoid spores, ornamented with low rounded warts. The spores are 12–14 x 10–12 μm and contain one large oil droplet.

TAXONOMIC NOTES: Described by Gilkey (1916) from California.

DISTRIBUTION: Extremely rare; currently known from seven sites, three of which are in California, where it occurs along the coast and in the mountains. No specific details for location beyond "California" was given for the type collection. Two of the three California collections are historic, (late 1800's/early 1900's), and despite efforts to recollect it from the Guadeloupe Mines area (one of the original

sites), it has not been found. Three recent collections come from southern Oregon, in the Medford-Ashland area. **USA: CA:** Location unknown (Type). **Placer Co.**, TNF, North Fork American River, 15 mi W of Truckee. **Santa Clara Co.**, Guadeloupe Mines. **OR: Jackson Co.**, Emigrant Lake County Park. Jacksonville Cemetery. Whetstone Savanna Preserve. **UT: Sanpete Co.**, Manti-LaSal National Forest, near Great Basin Experimental Station.

DESCRIPTION: FRUIT BODY 1–1.5 cm across, irregularly lobed, occasionally elongated, rather firm. **PERIDIUM** smooth to minutely scaly, dry. Silver-white when young, becoming yellowish in age. **GLEBA** solid, yellowish, with paler meandering veins containing asci, spores, and hyphae; giving it a marbled appearance. **STIPE** absent. **RHIZOMORPHS** usually with a single thread when young. **ODOR** unknown. **TASTE** unknown. **MICROSCOPY: Spores** 12–14 x 10–12 μm , subglobose to broadly ellipsoid, ornamented with low rounded warts, containing one large oil droplet. **Asci** 70–100 x 20–25 μm , clavate, stipitate, 8-spored, rupturing easily, tips turning blue in Melzer's reagent. **Peridium** 200–250 μm thick, of twisted and fixed hyphae (pseudoparenchyma), continuous with gleba. **Hymenium-lined** veins filled with closely interwoven hyphae, becoming loosely arranged around asci.

ECOLOGY: Hypogeous, solitary or scattered, buried in duff or soil. Most likely ectomycorrhizal. Collections come from a number of different habitats, and most have oaks (*Quercus garryana*, *Q. kelloggii* and *Q. agrifolia*) as the dominant tree species, a few have Douglas-fir (*Pseudotsuga menziesii*) and Pacific Madrone (*Arbutus menziesii*) mixed in with the oaks. The Sierra Nevada site was a mixed conifer old-growth forest dominated by White fir (*Abies concolor*). The Utah collection came from an Engelmann Spruce (*Picea engelmannii*) forest. Fruiting in spring and summer.

SIMILAR SPECIES: *Tuber* species resemble *Hydnotryopsis* macroscopically, but can be readily distinguished by their spores, which are ornamented with spines, or a spiny reticulum surrounding honeycomb-like pits. *Choiromyces alveolatus* has a rounded to irregularly shaped fruit body with a pinkish buff to brownish peridium, and a creamy yellow, peach-orange to pale ochre gleba, marbled with whitish veins. Microscopically it has large (22–36 μm broad) globose spores, with a dimpled surface (resembling golf balls) and a single, dark droplet. *Hydnobolites californicus* has an irregularly shaped fruit body, with a dingy pinkish-brown to brownish peridium, and a slightly darker, yellowish, grayish to yellowish brown gleba, marbled with whitish veins. The spores are globose, and rather pale; ornamented with a blunt spiny reticulum surrounding coarse honeycomb-like pits.

Photo: © Michelle Seidl.

Lactarius rubriviridis

Desjardin, H.M. Saylor & Thiers

COMMON NAME:

SPECIES CODE:



FAMILY: Russulaceae

SYNONYMS: None

SUMMARY: *Lactarius rubriviridis* is easily recognized by its hypogeous habit, irregularly rounded, ovoid to ellipsoid, sequestrate fruit body which lacks a peridium; the pitted and ridged, reddish brown to dark brown gleba is exposed. The gleba has small, yellowish white to orangish white, irregular to elongate open locules, and white to yellowish trama which exudes a deep red latex. It has a rudimentary to well-developed whitish columella, which slowly stains greenish. More rarely it has a larger central fleshy area surrounded by gleba. Currently known from three locations, two in California and one in Oregon. Despite yearly attempts to relocate it at the type location, it has not been found there since. The description here is derived from Desjardin (2003), more collections may lead to variation to what has been described.

TAXONOMIC NOTES: Described by Desjardin (2003) based on two collections, made 19 years apart. The type collection came from Tahoe National Forest, in Sierra County, California.

DISTRIBUTION: Known from two collections (from 1350 and 1800 m in elevation) in the central and northern Sierra Nevada in California, and a single location in “central Oregon” (Kuo 2005), presumed to have been made in the eastern Cascades. **USA: CA: Sierra Co.,** TNF, Cold Creek Campground off Highway 89 (Type). **Mariposa Co.,** YNP, Foresta Campground. **OR:** 1 site.

DESCRIPTION: **FRUIT BODY** 2–6 cm across, 2.5–4.5 cm tall, irregularly rounded, ovoid, ellipsoid to irregularly lobed. **PERIDIUM** absent, surface with pits, ridges and honeycomb-like openings from exposed locules and trama. Reddish brown to dark brown, staining or discoloring deep greenish gray to bluish green or dark green. **GLEBA** firm, with small, open irregular to elongate locules. Locules yellowish white to orangish white from spores, trama white to yellowish white, soon reddish brown when cut from exuding latex. **COLUMELLA** rudimentary to well-developed, composed of small veins radiating from a central larger vein, or basal pad (one collection had a large central fleshy area). White at first, slowly staining greenish white to grayish green. **LATEX** scant, deep red, staining trama tissue dark brownish red. **STIPE** typically absent. **ODOR** indistinct to slightly sweet. **TASTE** mild. **SPORE DEPOSIT** orangish white, yellowish to cream. **MICROSCOPY:** **Spores** (8) 8.5–11 x (7) 7.5–8.5 μm , ovoid to ellipsoid, inequilateral in profile with an eccentric hilar appendix, ornamentation 0.5–1.0 μm tall, dense, with a complete to partial reticulum; suprahilar plage small, smooth to weakly ornamented. Spores strongly amyloid in Melzer’s reagent, hyaline in KOH. **Basidia** 40–60 x 11–13.5 μm , clavate, 4-spored; sterigmata curved, up to 6.5 μm long. **Basidioles** cylindrical to clavate. **Pseudocystidia** scattered, cylindrical with a tapered apex, projecting slightly beyond the basidia, hyaline or with orange globular contents. **Trama** composed of densely compact, fused, cylindrical to subcellular hyphae, 3–10 μm wide, hyaline in KOH, dextrinoid (red) in Melzer’s reagent. **Laticiferous hyphae** abundant, contorted to constricted, 3–5 (10) μm wide, refractive, yellowish orange to tawny in KOH. **Sphaerocysts** absent. **Clamp connections** absent.

ECOLOGY: Hypogeous, solitary or scattered, buried under duff. Ectomycorrhizal with Pinaceae; known locations have both pine (*Pinus* spp.) and fir (*Abies* spp.). Both California collections have been found in disturbed areas (campgrounds), fruiting in spring.

SIMILAR SPECIES: Some *Gautieria* species superficially resemble *Lactarius rubrivividis*, but have a rubbery texture, lack the red latex and have inamyloid, ellipsoid to ovoid to globose spores, often ornamented with longitudinally spirals or ridges.

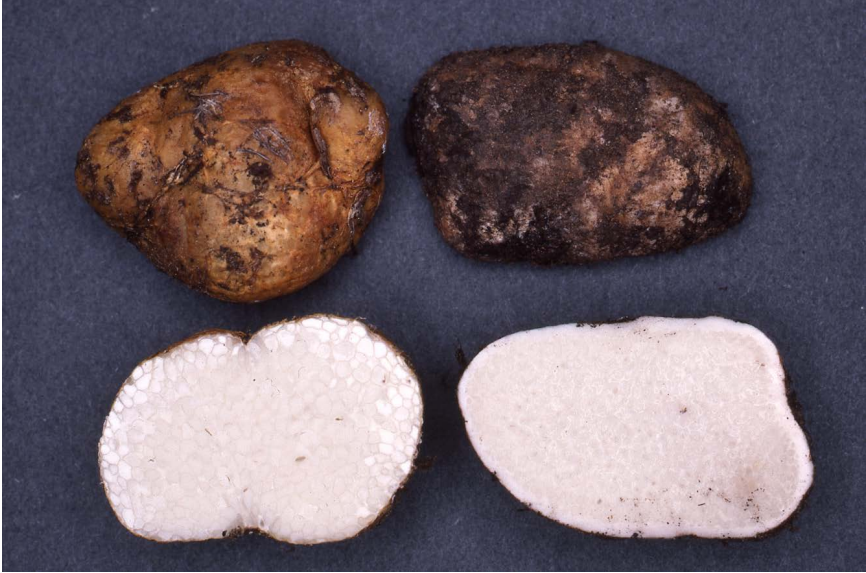
Photo: © Mike Wood.

Leucogaster microsporus

Fogel nom. prov.

COMMON NAME:

SPECIES CODE: LEMI26



FAMILY: Albatrellaceae

SYNONYMS: None

SUMMARY: This hypogeous, sequestrate fungus can be recognized by the small to medium kidney-shaped to elongate hypogeous fruit body, with a whitish to yellow peridium. The gleba is made up of white, rounded locules, which exude a sticky white latex when cut. Microscopically, *Leucogaster* spores are ornamented with reticulate spines, often with low connecting lines forming 5- or 6-sided honeycomb-like pits. The spores are also enclosed in a hyaline perispore sac (a sheath or membrane that envelops the spore wall). *Leucogaster microsporus* is distinguished from similar *Leucogaster* species (e.g. *L. citrinus*) by having smaller spores. This species appears to be quite rare; currently known from 14 sites, two of which are in California.

TAXONOMIC NOTES: *Leucogaster microsporus* is a well-known species, profiled by Fogel (1975), Zeller & Dodge (1924), and Castellano et al. (1999). Although it was given a provisional name in 1975, it still needs to be formally published.

DISTRIBUTION: Known from two sites in northern California in the southern Cascades, continuing north in the Cascades and Coast Range of Oregon, where

it is known from 10 sites, and from two sites in the southern Washington Cascades. **USA: CA: Siskiyou Co.**, S-TNF, Raccoon Creek. **Trinity Co.**, Castle Crags State Park, Soda Creek. **OR:** 10 sites. **WA:** 2 sites.

DESCRIPTION: **FRUIT BODY** 1–5 cm across, kidney-shaped, elongate to ovoid, underside indented. **PERIDIUM** dry, smooth, white with scattered yellow stains at first, developing more yellow in older specimens, drying pale red. **GLEBA** locules rounded, 0.05–0.1 cm across. White, drying pale yellow, exuding sticky, white latex when cut. Central locules near basal indentation lacking spores. **STIPE** absent. **RHIZOMORPHS** absent. **ODOR** sweet. **TASTE** unknown. **KOH** pale yellow on peridium. **MICROSCOPY:** **Spores** 6–10 x 5–6 μm , including spiny ornamentation, subglobose; ornamented with reticulate spines 0.25–0.5 μm high, 2 μm apart, with low connecting lines forming 5- or 6-sided honeycomb-like pits. Spores enclosed in a hyaline perispore sac (a sheath or membrane that envelops the spore wall). **Basidia** 30–60 x 6–7 μm clavate, thin-walled, hyaline, 4-spored, and lacking sterigmata. **Basidioles** 30–55 x 3–4 μm , clavate, thin-walled, hyaline, occasionally with a hyaline crystalline encrustation in KOH. **Trama** 60–125 μm thick, of subparallel, thin-walled, septate hyphae, 2–3 μm wide, some cells inflated to 10 μm wide, yellow in KOH. **Peridium** 100–300 μm thick, composed of parallel, thin-walled hyphae, 3–5 μm wide, cells inflated to 15 μm . Outer 60 μm obscured by yellow amorphous pigment balls in Melzer's reagent.

ECOLOGY: Hypogeous, solitary or scattered, buried in duff or soil. Ectomycorrhizal; associated with Pinaceae, especially Douglas-fir (*Pseudotsuga menziesii*) and Western Hemlock (*Tsuga heterophylla*). Most collections come from mid-elevation conifer forest in the Cascades. Fruiting in late summer and fall.

SIMILAR SPECIES: *Leucogaster citrinus* is typically slightly more yellow when fresh, and has larger spores, 8–11 x (7) 8–9 μm . *Leucogaster odoratus* has more orange colors, and spores that are round, or nearly so, 8–11 μm broad. *Leucogaster rubescens* is whitish to pink when young, becoming brick-red to brownish, in age, and has globose to subglobose spores measuring 10–15 x 10–13 μm . *Leucophleps spinispora* resembles *Leucogaster*, with whitish colors, and exudes a sticky white latex when cut, but has more irregular, almost maze-like locules, and globose, thick-walled spores, 10–13 x 10–11 μm (including ornamentation), with occasionally spores up to 20 μm broad. They are ornamented with crowded spines under 0.5 μm high, embedded in a gelatinous matrix. *Leucophleps magnata* is very similar to *L. spinispora*, but has larger, globose spores, (10) 15–17 (22) μm broad (including ornamentation). The ornamentation is also taller, 1–2 μm high, and embedded in a gelatinous matrix.

Photo: © Michael Castellano.

Mycolevis siccigleba

A.H. Sm.

COMMON NAME:

SPECIES CODE:



FAMILY: Albatrellaceae

SYNONYMS: None

SUMMARY: This hypogeous, sequestrate fungus has rounded to irregular-shaped, hypogeous fruit bodies that are rather soft and feel very light (said to be reminiscent of Styrofoam). It has a white peridium when young, that matures yellowish to grayish olive, and a white, buff to olivaceous gleba with small rounded locules. The spores are quite distinctive; strongly amyloid in Melzer's reagent, covered with crowded spines and with an amyloid basal collar. The ornamentation in KOH appears as spines projecting from a thick inner wall into a gelatinous outer wall. Currently known from ~60 sites in western North America; 12 of which are in California.

TAXONOMIC NOTES: Described by Smith (1965) from Priest River in northern Idaho.

DISTRIBUTION: Widespread; known from the southern mountains in California, north through the Sierra Nevada and Cascades, (with two coastal records) into the Pacific Northwest. Also in the Great Basin sky islands, Rocky Mountains, and Mexico. **USA: CA: Humboldt Co.,** Hoopa Indian Reservation. **Siskiyou Co.,** KNF,

Haypress Trail. KNF, Deadfall Meadows. KNF, Marble Mountain Wilderness Area. **Sierra Co.**, TNF, Yuba Pass. TNF, across road from San Francisco State University Sierra Nevada Field Campus. TNF, Wild Plum Campground. TNF, Haskell Peak Road. **Fresno Co.**, SieNF, 1 mi. east of Huntington Lake junction. SieNF, just south of Buck Meadow. **San Mateo Co.**, "Redwood Park". **San Bernardino Co.**, SBNF, Barton Flats. **OR:** 4 sites. **WA:** 6 sites. **ID:** 15 sites. **NV:** 1 site. **UT:** 14 sites. **CO:** 5 sites.

DESCRIPTION: **FRUIT BODY** 1–4 cm across, irregularly rounded, to irregularly lobed to angular, light, (consistency like Styrofoam), surface smooth with scattered rhizomorphs, often covered with adhering soil. **PERIDIUM** white when young, developing yellowish patches, to all yellowish, becoming grayish olive in age. Peridium thin. **GLEBA** very dry, soft and light; quite brittle when dry. Locules rounded, small, open. White when young, becoming buff to olivaceous when mature. Columella occasionally present, as a simple, unbranched, bluish gray vein, 0.1–0.2 cm wide. **STIPE** absent, often with a few appressed rhizomorphs over base. **ODOR** nauseating to fruity. **TASTE** mildly nauseating to fruity. **CHEMICAL REACTIONS:** No reaction to KOH. Peridium green to blue-green with Melzer's. **MICROSCOPY:** **Spores** 8–14 (18) x 19–12 (16) μm , globose to broadly ellipsoid; walls thick, two-layered. In KOH, the ornamentation appears as spines projecting from a thick inner wall into a gelatinous outer wall. In Melzer's reagent, the spines are amyloid, as is a thin layer on the outer wall; the ends of spines appear as spots on spore surface. Spore with a basal pore at the point of sterigmal attachment, which is surrounded by a broad amyloid collar. **Basidia** loosely arranged hymenium, 35–40 x 11–15 μm , clavate to top-shaped, colorless, thin-walled, 4-spored. **Brachybasidioles** 35–40 x 5–10 μm , clavate, colorless, thin-walled. **Cystidia** absent. **Peridium** (30) 190–250 μm thick. **Peridium subcutis** of interwoven, hyaline, thin-walled hyphae 3–5 μm wide. **Peridium epicutis** a tangled turf of (often collapsed) colorless, thin-walled, septate hyphae 2.5–5 μm wide. Both layers dark green in Melzer's, amyloid debris abundant throughout. **Clamp connections** absent.

ECOLOGY: Hypogeous, solitary or scattered, buried in duff or soil. Ectomycorrhizal, most collections come from forest with fir (*Abies* spp.) and spruce (*Picea* spp.). Likely also with Douglas-fir (*Pseudotsuga menziesii*). One Central Coast collection was made under Tanoak (*Notholithocarpus densiflora*). Fruiting from spring into fall.

SIMILAR SPECIES: Both *Leucogaster* and *Leucophleps* superficially resemble *Mycolevis*. *Leucogaster* species have rounded locules which exude a white, sticky latex

when cut (if fresh), and have inamyloid, colorless, reticulate spores encased in a loose-fitting membrane. *Leucophleps* fruit bodies also exude a whitish, sticky fluid when cut open, have crowded maze-like to irregular locules, and inamyloid spores which are ornamented with crowded, short spines, embedded in a mucilage-like gel.

Photo: © Michael Castellano.

Protogautieria substriata

Thiers

COMMON NAME:

SPECIES CODE:



FAMILY: Gomphaceae

SYNONYMS: None

SUMMARY: The hypogeous habit, ovoid to rounded, sequestrate fruit body with a whitish peridium when young, brown in age, the whitish to yellow gleba with wrinkled to alveolate empty locules, and the black KOH reaction on the peridium are helpful macroscopic features. It can be difficult to distinguish from some *Gautieria* species in the field. Microscopically, the strongly dextrinoid spores, showing distinct longitudinal folds or striations in Melzer's reagent, but appearing smooth in water or KOH can confirm its identity. *Protogautieria substriata* is a rare and poorly known species; currently known from seven collections from four locations. Occurs in high-elevation forests, under fir (*Abies magnifica* and *A. concolor*), and Lodgepole Pine (*Pinus contorta* ssp. *murrayana*) in the Sierra Nevada.

TAXONOMIC NOTES: Described by Thiers (1979) from Huntington Lake, Sierra National Forest. Placement in Gomphaceae is assumed based on its resemblance to *Gautieria* species (which reside in Gomphaceae), no DNA sequences have been reported for *Protogautieria substriata* that could be used to assess family placement.

DISTRIBUTION: Extremely rare; currently known from four sites in the Sierra Nevada. Suitable habitat continues into the southern Cascades; attempts should be made to locate other populations of this species, and to revisit the known sites. **USA: CA: Sierra Co.,** TNF, San Francisco State University Sierra Nevada Field Campus, near Yuba Pass. TNF, Yuba Pass. **Tuolumne Co.,** StaNF, Pinecrest. **Fresno Co.,** SieNF, Huntington Lake (Type).

DESCRIPTION: **FRUIT BODY** 1.5–2.5 cm across, ovoid to nearly round, often with irregular pits or furrows. **PERIDIUM** dry, dull, glabrous to faintly tomentose. White to whitish when young, discoloring and aging dark brown. Peridium up to 0.1 cm thick. **GLEBA** with wrinkled to alveolate empty locules, (somewhat suggestive of the folding seen in the hymenium of the Tuberales). White to whitish when young, becoming pale yellow to yellow in age. Unchanging when cut, or sometimes showing pale reddish tints. **STIPE** absent. **RHIZOMORPHS** absent. **ODOR** unknown. **TASTE** unknown. **KOH** black on the peridium, all other chemical tests negative. **MICROSCOPY:** **Spores** 12.4–17 x 7.5–9.5 μm , ovoid to nearly subglobose, thick-walled, hyaline to pale yellow and smooth in KOH; strongly dextrinoid and showing distinct longitudinal folds or striations in Melzer's reagent but no ornamentation visible on spore wall. **Basidia** 32–40 x 10–12 μm , clavate, hyaline, 4-spored. **Cystidia** absent. **Trama** of locule walls interwoven, thin-walled, hyaline hyphae 3–5 μm wide. **Peridium** composed of more or less interwoven hyphae, hyaline in KOH, hyaline to pale yellow in Melzer's reagent.

ECOLOGY: Hypogeous, solitary or scattered, buried in duff or soil. Known from subalpine forest, in association (likely ectomycorrhizal) with Pinaceae, especially under fir (*Abies magnifica* and *A. concolor*), and Lodgepole Pine (*Pinus contorta* ssp. *murrayana*). Collections have been made in spring and fall; it is likely to fruit through summer if conditions are favorable.

SIMILAR SPECIES: Many *Gautieria* species resemble *Protogautieria substriata* although they typically have pinker, buff, peach-orange, cinnamon or ochre tones to the gleba. *Gautieria* species have ellipsoid to ovoid, obovoid, or globose spores, and are ornamented with longitudinal spirals, forked ridges or wings, often with rounded to bumpy margins. A number of California's *Gautieria* species remain undescribed, and many will not match published descriptions.

Photo: © Michael Castellano.

Rhizopogon abietis

A.H. Sm.

COMMON NAME:

SPECIES CODE: RHAB



FAMILY: Rhizopogonaceae

SYNONYMS: None

SUMMARY: The hypogeous habit, rounded to irregular, sequestrate fruit body with a rubber texture, yellow to brown-yellow young peridium that stains pink to vinaceous when bruised, aging dark olive to brown with yellow to red-brown blotches, a whitish to dark olive gleba and fusoid to subcylindrical spores measuring $7.5\text{--}13 \times 3\text{--}5$ (6) μm help distinguish *Rhizopogon abietis*. Currently known from two sites in California, and ~ 15 sites scattered through the Oregon Cascades and Rocky Mountains.

TAXONOMIC NOTES: Described by Smith and Zeller (1966) from Payette National Forest, near McCall, Idaho.

DISTRIBUTION: Reported from the Klamath Mountains in California, the Oregon Cascades, and scattered sites in the Rocky Mountains. It has also been reported from eastern North America, from Ontario south into Tennessee; these records should be further investigated. **USA:** **CA:** Siskiyou Co., KNF, Deadfall Meadows west of Gazelle. West of Hilt. **OR:** 5 sites. **ID:** 7 sites. **Valley Co.,** Payette Na-

tional Forest, South Fork of Lake Fork Creek (Type). **WY:** 1 site. **NM:** 1 site.

DESCRIPTION: **FRUIT BODY** 1–4 cm across, rounded, irregularly rounded to ovoid, firm, rubbery. **PERIDIUM** yellow to brown-yellow when young, with pink to vinaceous patches or blushes where bruised, with age dark olive to brown, with yellow to red-brown blotches. Surface mostly smooth when young, occasionally scaly in age, with basal rhizomorphs, often appressed on lower portions. Peridium whitish at first when cut, soon becoming pink. **GLEBA** soft at first, soon firm, rubbery, sponge-like with tiny open locules. White when young, becoming dark olive to olive-brown when mature. Columella absent. **ODOR** indistinct. **TASTE** indistinct. **CHEMICAL REACTIONS:** KOH on peridium pale orange to red or red-brown; FeSO_4 on peridium slight olive. **MICROSCOPY:** **Spores** 7.5–13 x 3–5 (6) μm , fusoid to subcylindric or occasionally ellipsoid, ovoid, narrowly clavate or slightly allantoid, smooth, thin-walled, colorless singly, olive in mass in KOH, inamyloid. **Basidia** 12–24 x 4–10 μm , clavate, thin-walled. **Brachybasidioles** 4–10 x 4–8 μm , ellipsoid to clavate, hyaline, with thick gelatinous walls. **Cystidia** absent. **Trama** of hyaline hyphae 2–7 μm wide; walls gelatinous-thickened, glassy appearing. Subhymenium of thick-walled isodiametric cells 4–6 μm across. **Peridium** up to 1000 μm thick, of appressed, interwoven, hyaline to pale yellow thin-walled hyphae, 5–10 μm wide, with many cells inflated up to 15 (25) μm . Young specimens with tufts of scattered clavate terminal cells up to 14 μm wide; collapsing in age. Inner layer with abundant, extracellular deposits of amorphous red-orange to rusty brown pigment in KOH or forming pink to orange-brown globules in Melzer's reagent. **Clamp connections** absent.

ECOLOGY: Hypogeous to emergent from duff; solitary, scattered or in groups. Ectomycorrhizal, reportedly associated with Pinaceae (*Abies*, *Tsuga*, *Picea*, and *Pinus* spp.). California collections come from high-elevation, relative dry forest. Fruiting in summer and fall.

SIMILAR SPECIES: Many other rhizopogon resemble this species and are notoriously hard to identify. Field identification is not possible for most species; microscopic features need to be observed. Studies have also shown that molecular sequences may be the only way to reliably distinguish species. Members of the *Rhizopogon rubescens* group have smaller spores (roughly 7–10 x 3–4 μm). *Rhizopogon evadens* has a whitish, yellowish to grayish orange peridium, which bruises magenta, and smaller spores, 5.5–8 x 2.5–3 (3.5) μm . *Rhizopogon ventricosporus* has wider spores measuring 9–13 x 6–8 μm . *Rhizopogon vulgaris* has considerably smaller spores: 5.5–8 x 2–2.6 μm .

Photo: © Michael Castellano.

Rhizopogon brunneiniger

A.H. Sm.

COMMON NAME:

SPECIES CODE: RHBR5



FAMILY: Rhizopogonaceae

SYNONYMS: None

SUMMARY: The hypogeous habit, rounded to irregular, sequestrate fruit body with a rubbery texture, a smooth, shiny, dark cinnamon to dark red-brown peridium that develops blackish brown stains when handled, and a whitish to olivaceous gleba distinguish this species macroscopically. Microscopically, it has small, cylindrical to narrowly oblong spores, measuring 5–6.5 (7) x 1.8–2.5 μm . Currently known from three sites in California and eight sites scattered through the Oregon Cascades.

TAXONOMIC NOTES: Described by Smith and Zeller (1966) from Mount Hood National Forest (about 10 miles south of Mount Hood), Oregon. Many *Rhizopogon* species lack distinctive morphological characters and can only be reliably identified with molecular sequences.

DISTRIBUTION: Rare; known from three sites in California; one coastal, one in the southern Sierra Nevada, and one in the Klamath Mountains. Known from eight sites in the Coast Range and Cascades in Oregon. **USA:** **CA:** Marin Co., near

Inverness. **Siskiyou Co.**, KNF, Deadfall Meadows. **Fresno Co.**, SieNF, Ross Creek Watershed, Turtle Creek. **OR:** 7 sites. **Clackamas Co.**, Mount Hood National Forest, Barlow Forest camp (Type).

DESCRIPTION: FRUIT BODY 1–3cm across, rounded, irregularly rounded, to more elongate-ellipsoid, typically shorter than wide, firm, rubbery, surface smooth, shiny. Underside with a single or basal group of rhizomorphs. **PERIDIUM** dark cinnamon to dark red-brown, occasionally with darker blotches, developing blackish brown stains when handled; black and shiny when dry. **GLEBA** firm, rubbery, sponge-like with tiny open locules. Whitish at first, soon yellowish, to olivaceous when mature, pale brown to olive on drying. Columella absent. **STIPE** absent. **ODOR** indistinct to fruity or cheesy. **TASTE** unknown. **MICROSCOPY: Spores** 5–6.5 (7) x 1.8–2.5 μm , cylindric to narrowly oblong, smooth, thin-walled, colorless singly, yellow-brown in mass in KOH; inamyloid, yellowish singly, slightly darker in mass, and typically with a false septum in Melzer's reagent. **Basidia** 8-spored. **Brachybasidioles** hyaline, becoming thick-walled. **Cystidia** absent. **Trama** of interwoven, hyaline gelatinous hyphae. **Subhymenium** cellular, thick-walled. **Peridium** a single layer of interwoven, hyaline, thin-walled hyphae; pigment forming large rusty brown to fuscous brown balls in Melzer's reagent. **Clamp connections** absent.

ECOLOGY: Typically hypogeous, more rarely emergent from duff. Ectomycorrhizal, probably associated with multiple members of Pinaceae. Most sites have hemlock (*Tsuga* spp.) present, others have pine (*Pinus* spp.), fir (*Abies* spp.), or Douglas-fir (*Pseudotsuga menziesii*). Fruiting in fall, more rarely spring and summer.

SIMILAR SPECIES: Many *Rhizopogon* collections resemble this species and are notoriously hard to identify. Field identification is not possible for most species; microscopic features need to be observed. Studies have also shown that molecular sequences may be the only way to reliably distinguish species. The *Rhizopogon parksii/villosulus* group can be distinguished by its whitish to grayish peridium when young, overlaid with appressed dark fibrils, becoming dark brown to blackish brown in age, typically staining bluish green when scraped, an inky KOH reaction and growth with Douglas-fir and Sitka Spruce (*Picea sitchensis*).

Photo: © James Trappe.

Rhizopogon ellipsosporus

Trappe, Castellano & Amar.

COMMON NAME:

SPECIES CODE: RHEL3



FAMILY: Rhizopogonaceae

SYNONYMS:

SUMMARY: The hypogeous habit, rounded to irregular, sequestrate fruiting body with a rubbery texture, reddish brown to brown peridium with scattered appressed rhizomorphs, a pale yellow-brown gleba, and rather short and wide spores (for a rhizopogon) help distinguish *Rhizopogon ellipsosporus*. Known from a single site in the California Coast Range, in Mendocino National Forest, just south of the Yolla Bolly Wilderness, and from seven sites in Oregon.

TAXONOMIC NOTES: Described by Trappe & Castellano (2000) from ~15 miles west of Grants Pass, Oregon. Many *Rhizopogon* species lack distinctive morphological characters and can only be reliably identified with molecular sequences. The short broad spores are rather distinctive, making this a relatively easy species to identify.

DISTRIBUTION: Rare; known from a single site in the California Coast Range, and scattered sites in the Siskiyou and Cascade Mountains in Oregon. **USA:** CA:

Tehama Co., MeNF, Forks Ridge. **OR:** 7 sites. **Josephine Co.**, Rogue River-Siskiyou National Forest, end of FR 2500518, northeast of Taylor Creek (Type).

DESCRIPTION: **FRUIT BODY** 1–2.5 cm across, irregularly rounded to ovoid, firm, rubbery. **PERIDIUM** reddish brown to brown, covered with concolorous, scattered appressed rhizomorphs. **GLEBA** firm, rubbery, sponge-like with tiny open locules. Pale yellow-brown, developing slight olivaceous tones in age. Columella absent. **STIPE** absent. **ODOR** unknown. **TASTE** unknown. **MICROSCOPY:** **Spores** (4) 4.5–6 x 3–4 μm , ellipsoid to obovoid, smooth, thin-walled, colorless singly, brownish yellow in mass in KOH. **Basidia** 12–24 x 4–10 μm , clavate, thin-walled. **Brachybasidioles** 13–20 (30) x 4–10 μm , ellipsoid, hyaline, with thick gelatinous walls. **Cystidia** absent. **Trama** with a central strand of loosely interwoven, hyaline hyphae 2–3 μm wide; walls gelatinous-thickened, glassy appearing. The broad zones between the central strand and locule margins composed of similar, but tightly interwoven hyphae which diverge to form a filamentous subhymenium. **Peridium** 120–160 μm thick, of appressed, interwoven hyaline to pale yellow, thin-walled hyphae, 3–4 μm wide, with many cells inflated to 4–6 μm . With abundant, extracellular deposits of amorphous yellow-brown pigment in KOH, or orange-brown in Melzer's reagent. **Clamp connections** absent.

ECOLOGY: Hypogeous, solitary or scattered in duff or soil in old-growth forests, Ectomycorrhizal, likely associated with Douglas-fir (*Pseudotsuga menziesii*). Fruiting in fall, more rarely in spring.

SIMILAR SPECIES: Many rhizopogon resemble this species and are notoriously hard to identify. *Rhizopogon oregonensis* has much wider peridial hyphae (4–15 μm wide) a subhymenium of isodiametric cells, and slightly narrower spores 5–5.6 x 2.8–3.5 μm). *Rhizopogon exiguus* is typically white with ochraceous patches when young, becoming more brownish in age, and has broadly truncate spores measuring 7–8 x 5–5.5 μm .

Rhizopogon flavofibrillosus

A.H. Sm.

COMMON NAME:

SPECIES CODE: RHFL4



FAMILY: Rhizopogonaceae

SYNONYMS: None

SUMMARY: The hypogeous habit, rounded to irregular, sequestrate fruiting body with a rubbery texture and a pallid peridium with straw yellow to brownish yellow rhizomorphs, purplish red reaction to KOH on the peridium whitish to olivaceous gleba, and ellipsoid to nearly oblong spores help distinguish this species. Known from 11 sites total; three in California.

TAXONOMIC NOTES: Described by Smith and Zeller (1966) from Idaho. The Channel Island collection was associated with Bishop Pine (*Pinus muricata*). Follow-up studies only found *Rhizopogon vulgaris* and *R. occidentalis* on the islands. Many *Rhizopogon* species lack distinctive morphological characters and can only be reliably identified with molecular sequences.

DISTRIBUTION: Widespread, but rarely collected. Known from three sites in California: two in the Klamath Range and one on the Channel Islands. Seven additional sites are known from the Siskiyou Mountains and Cascades in Oregon, and in the northern Rocky Mountains. **USA: CA: Del Norte Co.,** SRNF, junction of

Roads 15 and 13N28. **Siskiyou Co.**, KNF, Deadfall Meadows. **Santa Barbara Co.**, Channel Islands National Park, Santa Cruz Island. **OR:** 5 sites. **ID:** **Valley Co.**, Boise National Forest, Smiths Ferry (Type). **MT:** 1 site.

DESCRIPTION: **FRUIT BODY** 3–5.5 cm across, typically wider than tall, rounded to irregularly lobed, firm, rubbery, dry, covered with rhizomorphs. **PERIDIUM** pallid when young, soon covered with straw-yellow to brownish yellow fibrils and rhizomorphs, (giving it a streaked appearance). Becoming variably colored in age; pallid in protected areas, with greenish yellow or rose tinted patches, with brownish yellow fibrils. **GLEBA** firm, rubbery, sponge-like with tiny open chambers up to 0.05 cm across in age. Whitish, to pale olivaceous when mature. Columella absent. **STIPE** absent. **RHIZOMORPHS** usually clustering at base, extending over surface. **ODOR** unknown. **TASTE** unknown. **CHEMICAL REACTIONS:** KOH dull purplish red on peridium. FeSO₄ on peridium slowly pale olivaceous. **MICROSCOPY:** **Spores** 5.5–6.5 (7) x 2.5–2.8 μm, narrowly ellipsoid to nearly oblong, smooth, thin-walled, colorless in KOH, pale yellowish in Melzer's. **Basidia** 16–20 x 6–7 μm, thin-walled, collapsing readily. Basidioles resembling basidia. **Cystidia** absent. **Trama** of subparallel to interwoven, colorless, refractive hyphae 2–4 μm wide. **Peridium epicutis** a trichodermium of short-branched hyphae when young; end cells 26–40 x 5–9 μm, subcylindric to clavate, colorless and thin-walled. **Trichodermium** collapses and is not noticeable on dried material. **Peridium subcutis** of appressed parallel to interwoven hyphae, red in KOH from dissolved pigment, some encrusting pigment present on, or near surface. **Clamp connections** absent.

ECOLOGY: Hypogeous, solitary or scattered, buried in duff or soil. Ectomycorrhizal, found in forest with Douglas-fir (*Pseudotsuga menziesii*), Ponderosa Pine (*Pinus ponderosa*), and other members of Pinaceae. Under Bishop pine (*Pinus muricata*) on Santa Cruz Island. Fruiting in late summer and fall.

SIMILAR SPECIES: Many rhizopogon resemble this species and are notoriously hard to identify. The common pine associate, *Rhizopogon occidentalis*, is covered with conspicuous rhizomorphs, and has pale yellow colors at first, soon developing darker yellow colors and reddish stains as it ages.

Photo: © Michael Castellano.

Schenella pityophila

(Malençon & Riousset) Estrada & Lado

COMMON NAME:

SPECIES CODE:



FAMILY: Geastraceae (Schenellaceae nom. prov.)

SYNONYM: *Pyrenogaster pityophilus* Malençon & Riousset

SUMMARY: A hypogeous, sequestrate fungus with a firm, rounded fruiting body with a felty exterior, a thick, tough inner wall and a gleba composed of elongate peridioles radiating from a central rounded columella. Currently known from ~25 collections, from 12 locations in western North America, four of which are in California.

TAXONOMIC NOTES: Originally described from France as *Pyrenogaster pityophilus*, later transferred to the genus *Schenella* (Estrada-Torres et al. 2005). Additional studies are needed to confirm that North American and France specimens are conspecific.

DISTRIBUTION: Known from ~25 collections from eight locations in southwest Oregon; and four sites in the Klamath Range and Sierra Nevada in California. Also known from Mexico and France. **USA: CA: Del Norte Co.**, near Idlewild. **Shasta Co.**, Whiskeytown National Recreation Area. **Sierra Co.**, TNF, Wild Plum Campground. **Kern Co.**, Location unknown, "At gate approximately 3 miles from

summit". **OR:** 8 sites.

DESCRIPTION: **FRUIT BODY** 1.5–2.5 cm across, rounded, ovoid to ellipsoid, firm. **PERIDIUM** two layered. Exterior covered with a thin cottony to felty, whitish to pinkish separable membranous mycelium with whitish to yellowish rhizomorphs. Lower layer smooth, or nearly so, white to pinkish, 0.1–0.4 cm thick in cross section. **GLEBA** composed of elongate peridioles ~0.2 mm wide, radiating from a central rounded columella. Peridioles whitish when very young, soon brownish and firm when immature, becoming dark brown to blackish and powdery when mature. Columella whitish. **STIPE** absent. **ODOR** mild. **TASTE** unknown. **MICROSCOPY:** **Spores** 7–8 x 4–7 μm , globose to broadly ellipsoid, ornamented with large rounded to flattened warts. **Basidia** 35–40 x 3–4 μm , 2- to 8-spored (mostly 3- to 5-spored), cylindrical, many proliferating into thread-like epibasidium, 1–1.5 μm wide, and up to 150 μm long. **Capillitium** in peridiole of long brown filaments 1500–2000 x 2–6 μm , straight or sinuous, smooth, moderately thick-walled, not branching or septate, typically spurred or appendiculate at the base.

ECOLOGY: Hypogeous, solitary or scattered, buried in duff and soil. Saprotrophic, growing under Pinaceae, especially Douglas-fir (*Pseudotsuga menziesii*), Ponderosa Pine (*Pinus ponderosa*), true fir (*Abies* spp.), and occasionally oaks (*Quercus* spp.). Fruiting in late winter and spring, occasionally fall.

SIMILAR SPECIES: *Schenella simplex* is typically slightly larger and has much narrower peridioles radiating out from the central columella; up to 0.5 mm wide for *S. simplex*, versus ~2 mm wide for *S. pityophila*. Microscopically, *S. simplex* has smaller (5.5–7 x 4.2–5.5 μm) ellipsoid spores. *Radiigera* (*Geastrum*) *fuscogleba* has a smoother peridium and yellow brown to dark yellow brown spore mass when mature, and more maze-like glebal strands radiating from the central columella. Microscopically, it has globose, warted spores, 4.5–8 μm across, with warts up to 0.5 μm high. *Radiigera* (*Geastrum*) *taylorii* is very similar to *R. fuscogleba*, but has smaller, globose spores, 3–4 μm across.

Photo: © Jonathan Frank, www.mushroomobserver.org.

Schenella simplex

T. Macbr.

COMMON NAME:

SPECIES CODE:



FAMILY: Geastraceae (Schenellaceae nom. prov.)

SYNONYM: *Pyrenogaster atrogleba* (Zeller) L.S. Domínguez & Castellano, *Radiigera atrogleba* Zeller

SUMMARY: The hypogeous habit, sequestrate, firm, rounded fruiting body with a felty exterior, a thick, tough inner wall and gleba composed of elongate peridioles radiating (like accordion folds) from a central rounded columella. The peridioles are pale and firm when young, becoming black and powdery when mature. Microscopically, it has ellipsoid, finely warted spores measuring $5.5\text{--}7 \times 4.2\text{--}5.5 \mu\text{m}$.

TAXONOMIC NOTES: Originally described from Yosemite Valley as *Schenella simplex* (MacBride 1911). The type specimen was missing the peridium, and was classified as a slime mold. Zeller (1944) described *Radiigera atrogleba* from Idaho, which was later placed into the genus *Pyrenogaster* (Domínguez de Toledo & Castellano, 1996). Phylogenetic and morphological studies by Estrada-Torres et al. (2005) concluded that *Pyrenogaster/Radiigera atrogleba* is conspecific with *Schenella simplex*.

DISTRIBUTION: Widespread in western North America, mostly in montane forest. Currently known from 14 sites in California, and 50+ sites in the Pacific North-

west and Rocky Mountains; also known from Mexico and Italy. **USA: CA:** Trinity Co., S-TNF, Tannery Gulch Campground. **Plumas Co.**, LNF, Lake Almanor, west shore. LNF, Swain Mountain Experimental Forest. Jennie Springs. **Sierra Co.**, TNF, Yuba Pass. TNF, Wild Plum Campground. **Placer Co.**, TNF, North Fork American River, 15 mi W of Truckee. **Mariposa Co.**, YNP, Yosemite Valley (Type). **Fresno Co.**, SieNF, Huntington Lake. SieNF, near Courtright Reservoir. SieNF; Along road 10S13. SieNF, near Bear Creek Falls. SieNF, near Buck Meadow. SieNF, Rock Creek Road. **OR:** 25 sites. **WA:** 8 sites. **ID:** 12 sites. **MT:** 1 site. **UT:** 1 site. **CO:** 1 site. **NM:** 1 site. **NE:** 1 site. **CANADA: BC:** 1 site.

DESCRIPTION: **FRUIT BODY** 1–4 cm across, rounded or nearly so, firm. Peridium two-layered: outer layer thin (~0.1 cm), tough, felty to cottony, roughened, and often covered with adhering debris. Whitish to yellowish, often developing grayish yellow to dingy colors in age. Inner layer 0.2–0.4 cm thick, tough, whitish to pinkish. **GLEBA** composed of elongate peridioles ~0.5 mm wide, radiating from a central, rounded columella. Peridioles whitish when very young, often sticky or goeey, darkening grayish, then powdery and blackish when mature. Columella protruding about halfway into gleba, rounded to capitate. White to grayish. **STIPE** absent; basal portion thickened. **ODOR** typically unpleasant, ink-like. A few collections have been described with a sweet, fruity odor. **TASTE** unknown. **MICROSCOPY:** **Spores** 5.5–7 x 4.2–5.5 μm , ellipsoid, (rarely globose) in front and side view, globose in polar view, finely warted. **Basidia** up to 28 μm x 1.5–2.5 μm , tubulose to filiform, 6- to 8-spored. **Capillitium** hyphae up to 7 μm wide, smooth, shiny, dark reddish brown; attached to peridium and columella, persisting as tubes when mature. **Peridium** two-layered, to 4200 μm thick.

ECOLOGY: Hypogeous, solitary, scattered, or in ‘nests’ of multiple fruit bodies. Typically buried in duff and soil, occasionally erumpent, sometimes on wood. Saprotrophic, growing under Pinaceae, especially Douglas-fir (*Pseudotsuga menziesii*), Ponderosa Pine (*Pinus ponderosa*), true fir (*Abies* spp.), and occasionally oaks (*Quercus* spp.). Fruiting in late winter and spring, occasionally fall.

SIMILAR SPECIES: *Schenella pityophilus* is typically slightly smaller and has wider peridioles (~0.2 cm wide) radiating out from the central columella, and has larger (7–8 x 4–7 μm) globose to broadly ellipsoid spores. *Radiigera* (*Geastrum*) *fuscogleba* has a smoother peridium and yellow brown to dark yellow brown spore mass when mature, and more maze-like glebal strands radiating from the central columella. Microscopically, it has globose, warted spores, 4.5–8 μm across, with warts up to 0.5 μm high. *Radiigera* (*Geastrum*) *taylorii* is very similar to *R. fuscogleba*, but has smaller, globose spores, 3–4 μm across.

Sedecula pulvinata

Zeller

COMMON NAME:

SPECIES CODE: SEPU15



FAMILY: Coniophoraceae

SYNONYMS: None

SUMMARY: Recognized by the often hypogeous, cushion-shaped, sequestrate fruiting body, with a tough whitish to gray peridium, black powdery gleba with tough cords, extending downwards, and growth in high-elevation forest. Microscopically, the large ovoid to irregular, smooth spores help set it apart from species that superficially resemble it. Currently known from 17 sites in California, and 15 sites elsewhere in western North America. Because of the dull colors and hypogeous to emergent habit, this species may be under-reported, and may be more common than currently thought.

TAXONOMIC NOTES: Described by Zeller (1941) from Mount Shasta, Siskiyou County, California.

DISTRIBUTION: Known from high-elevation forest from the southcentral Sierra, north into the southern Cascade Range, the sky islands across the Great Basin, and the Rocky Mountains. **USA: CA: Siskiyou Co.,** S-TNF, Mount Shasta (Type). S-TNF, near Little Glass Mountain. **Tehama Co.,** Mineral, Battle Creek Meadows

Ranch. **Lassen Co.**, LNF, Swain Mountain. **Plumas Co.**, LNF, Jennie Springs. **Sierra Co.**, TNF, Yuba Pass. TNF, across road from San Francisco State University Sierra Nevada Field Campus. TNF, Chapman Creek Campground. TNF, Green Acres, near Bassett's Station. **Placer Co.**, TNF, Robinson Flat Campground. TNF, North Fork American River, west of Truckee. **El Dorado Co.**, ENF, near 36-mile tract. **Amador Co.**, ENF, Silver Lake Campground. **Alpine Co.**, StaNF, Lake Alpine. **Tuolumne Co.**, StaNF, Stanislaus-Tuolumne Experimental Forest. **Fresno Co.**, SieNF, Giganta Campground. **San Bernardino Co.**, SBNF, Strawberry Peak. **OR:** 1 site. **ID:** 1 site. **NV:** 2 sites. **UT:** 5 sites. **CO:** 5 sites. **NM:** 1 site.

DESCRIPTION: **FRUIT BODY** 2–6 (9) cm across, 1–4 cm tall, cushion-shaped, rarely top-shaped, occasionally irregularly lobed, lacking a stipe, or with a rhizoid tuft or pad. Surface dry, smooth, at times with adhering soil, often slightly tomentose to fibrillose when old. **PERIDIUM** thick, tough, leathery above, underside of fruit body thinner, often disappearing in age. Whitish to gray. **GLEBA** coarsely loculate, firm when young, soon powdery, with fibrous trama cords. Dark brownish black to black, mottled with whitish, gray to tan trama, completely black when mature. **STIPE** indistinct, with coarse rhizomorphic cords extending into ground. **ODOR** indistinct when young, sometimes foul in age. **TASTE** indistinct. **MICROSCOPY:** **Spores** (18) 23–27 x 12–16 (20) μm , ovoid, ellipsoid or irregular, smooth, thick-walled, brown in KOH. **Basidia** narrow clavate, hyaline, 2-spored. **Cystidia** absent. **Glebal trama** interwoven, hyaline in KOH. **Peridium** a compacted trichodermium, composed of hyaline, interwoven, thin-walled hyphae 5–7 μm wide. **Clamp connections** absent.

ECOLOGY: Hypogeous to emergent in duff under conifers in high-elevation forest, especially under fir (*Abies* spp.) and pine (*Pinus* spp.). Fruiting in summer and early fall, fruit bodies may persist into late fall. Saprotrophic.

SIMILAR SPECIES: Some *Elaphomyces* species are superficially similar, but are typically smaller, round or nearly so, have a thick peridium around the entire fruiting body and a powdery spore mass when mature. Microscopically, *Elaphomyces* species are easily distinguished by the globose, spiny spores. *Scleroderma polyrhizum* has a thick peridium which splits at the top when mature, exposing a powdery spore mass; it lacks the cords through the gleba like *Sedecula pulvinata*, and has a thick basal peridium. Microscopically, *S. polyrhizum* (and other *Scleroderma* species) have globose, spiny spores, often with a reticulate ornamentation.

Trappea phillipsii

(Harkn.) Castellano

COMMON NAME:

SPECIES CODE:



FAMILY: Trappeaceae

SYNONYMS: *Hysterangium phillipsii* Harkn.

SUMMARY: A hypogeous, sequestrate fungus with a rubbery texture, round or irregularly shaped fruit body with a thick basal rhizomorph. The white peridium that stains bright pink to pinkish brown, green gleba with a sterile, whitish band around the exterior, and presence of a translucent columella help distinguish it in the field. Microscopically, it has small, smooth, oblong spores measuring 3–6 x 1–2 (2.5) μm . Widespread in California but rare; currently known from 12 sites in California and 10 sites outside the state.

TAXONOMIC NOTES: Described by Harkness (1899) from Placer County, California as *Hysterangium phillipsii*, later transferred to the genus *Trappea* (Castellano 1990). Based on initial phylogenetic analysis this species belongs in a distinct genus.

DISTRIBUTION: Rare but widespread across California; currently known from 12 sites in the state. Occurring from the southern mountains north through the Sierra Nevada and Coast Range, including two sites in the southern Oregon Cascades. Also known from eight sites in the Great Basin sky islands of Nevada,

Utah and western Colorado. **USA: CA: Humboldt Co.**, Trinidad, Spruce Cove. **Siskiyou Co.**, S-TNF, Mount Shasta, Horse Camp. S-TNF, Mount Shasta, Mud Creek Dam Road. **Mendocino Co.**, MeNF, near Green Springs. **Lake Co.**, Judge Davis Trail. **Lassen Co.**, LNF, Swain Mountain Experimental Forest. **Sierra Co.**, TNF, Lincoln Creek Campground. **Placer Co.**, near Auburn, Wire Bridge (Type). **Marin Co.**, Mount Tamalpais, Blythedale Canyon. **Santa Clara Co.**, San Jose, Grass Valley. **Los Angeles Co.**, location unknown. **San Bernardino Co.**, SBNF, east of Strawberry Peak. **OR:** 2 sites. **NV:** 1 site. **UT:** 5 sites. **CO:** 2 sites.

DESCRIPTION: **FRUIT BODY** 1–4 cm across, rounded to irregularly shaped, rubbery in texture, base with indentation, and with thick white rhizomorphs. **PERIDIUM** white at first, quickly staining bright pink to pale pinkish brown when handled. **GLEBA** dark to bright green, with a sterile whitish band near peridium, soft-gelatinous, with small, empty locules. **COLUMELLA** distinct, translucent, branching at middle of fruit body. **RHIZOMORPHS** single to multiple, rather thick, attached to base. White, staining pink. **ODOR** very strong, unpleasant, like gasoline. **TASTE** unknown. **CHEMICAL REACTIONS:** FeSO_4 greenish to blue-gray on peridium. **MICROSCOPY:** **Spores** 3–6 x 1–2 (2.5) μm , oblong, smooth. **Basidia** 10–20 x 2–5 μm , cylindric, 6- (8-) spored, sterigmata inconspicuous. **Cystidia** absent. **Subhy-menium** hyphae colorless, thin-walled, interwoven cells 2–4 μm wide, with scattered cells inflated up to 9 x 6 μm . **Trama** 30–50 μm thick, hyphae 1–3 μm wide, colorless, thin-walled, interwoven in a gelatinous matrix. **Sterile locules** ('pseudo-peridium') a gelatinized layer, up to 500 μm thick. **Peridium** 100–350 μm thick, composed of interwoven, colorless hyphae 3–5 μm across. **Hyphae** near surface inflated up to 25 μm . **Clamp connections** abundant on noninflated hyphae of peridium, on cells lining sterile locules, and on hyphae inside sterile locules.

ECOLOGY: Hypogeous, solitary or scattered under duff and in soil; usually around decaying wood. Found mostly in drier woodlands with Douglas-fir, (*Pseudotsuga menziesii*), pines (*Pinus* spp.), White Fir (*Abies concolor*), Red Fir (*Abies magnifica*), and oak (*Quercus* spp.). Fruiting from spring to fall in the mountains, and during winter and spring on the coast and in the foothills.

SIMILAR SPECIES: *Trappea darkeri* is very similar, but stains orange-brown, yellow-brown to brown (not pink). Microscopically, it has a thinner peridium (35–100 (200) μm) thick, which can disappear in age, and has larger spores measuring 4–5 (5.5) x 2–3 (3.5) μm . *Hysterangium* species can look very similar but lack the sterile band of whitish locules around the exterior of the gleba, and often have a peridium that separates easily from the gleba. Microscopically, they have considerably larger spores.

Tuber castellanoi

Bonito & Trappe

COMMON NAME: Oregon White Truffle (complex)

SPECIES CODE:



FAMILY: Tuberaceae

SYNONYMS: None

SUMMARY: *Tuber castellanoi* is a rare member of the *T. gibbosum* complex. As a complex, they are recognized by the hypogeous habit, and firm, rounded to irregularly lobed, sequestrate fruiting body, a smooth to pubescent, brownish white, orange-brown to brown peridium, solid whitish to brown gleba marbled with white veins, and an often 'truffly' odor. Microscopically, the epicutis of the peridium has scattered to abundant tangled hyphae and hyphal tips, with walls irregularly thickened (up to 2 μm thick), often in bands, and globose to broadly ellipsoid spores, ornamented with a spiny reticulum surrounding honeycomb-like pits. *Tuber castellanoi* is currently known from seven locations, three of which are in California.

TAXONOMIC NOTES: Described by Bonito et al. (2010) from a collection made at Ross Creek, SieNF, California. Identifying members of the "*Tuber gibbosum* complex" more precisely requires careful microscopic examination, and even then, distinguishing the various species morphologically is difficult.

DISTRIBUTION: Widespread but with a highly disjunct distribution, known from the southern Sierra Nevada, the Klamath Range, and lower elevation and coastal forests in California, Oregon, and Washington. Currently known from nine collections spanning seven locations. **USA: CA: Humboldt Co.,** SRNF, Cedar Spring Creek. **Sonoma Co.,** near Santa Rosa. **Fresno Co.,** SieNF, Ross Creek Watershed, Turtle Creek (Type). **OR:** 3 sites. **WA:** 1 site.

DESCRIPTION: **FRUIT BODY** 0.7–3 (8) cm across, rounded to irregularly lobed and randomly furrowed, very firm. **PERIDIUM** dry, finely pubescent, denser in furrows. Brownish white to tan when young, dull brown with ivory to pale brown lines and patches in age. **GLEBA** firm, solid. Whitish when young, light brown to brown when mature, marbled with narrow white, hypha-stuffed veins at all times. **COLUMELLA** absent. **RHIZOMORPHS** absent. **ODOR** unknown. **TASTE** unknown. **MICROSCOPY:** **Spores** globose to broadly ellipsoid, ornamented with a spiny reticulum, 2.5–4 μm high, surrounding honeycomb-like pits, light golden brown when mature, thick-walled. (Measurement excludes ornamentation) in 1-spored asci: 33–44 x 24–38 μm , $Q=1.0\text{--}1.6$. 2-spored asci: 24–40 x 20–36 μm , $Q=1.0\text{--}1.5$. 3-spored asci: 24–36 x 20–30 μm , $Q=1.0\text{--}1.4$. 4-spored asci: 20–35 x 18–28 μm , $Q=1.0\text{--}1.4$ (1.6). **Asci:** 1–4 (5)-spored, 50–80 x 40–60 μm , spherical, broadly ellipsoid to ovoid, colorless, thin-walled. **Peridium** 110–250 μm thick, hyphae variably twisted and fused (pseudoparenchyma) of several tiers of nearly colorless cells, inflated up to 35 μm wide near the epicutis.

ECOLOGY: Hypogeous, scattered under duff and in soil; mostly in drier woodlands with Douglas-fir, (*Pseudotsuga menziesii*), pines (*Pinus* spp), White Fir (*Abies concolor*), and oak (*Quercus* spp). The type location in the southern Sierra had *Abies concolor*, *Pinus lambertiana*, *Pinus ponderosa*, and *Calocedrus decurrens*. Some sites were *Pseudotsuga menziesii* monoculture. Fruiting in winter and spring.

SIMILAR SPECIES: There are four species in the *Tuber gibbosum* complex, of which *T. castellanoi* is a member. Macroscopically, they have firm, rounded to lobed sequestrate fruiting bodies, a solid, whitish, tan to brown gleba marbled with whitish veins, and a pungent “truffle” (spicy-garlicky/cheesy) odor when mature. Microscopically, the epicutis of the peridium of mature fruiting bodies has scattered to abundant tangled hyphae and hyphal tips, with irregularly thickened walls up to 2 μm , often arranged in bands. The individual species in the complex can only be reliably distinguished by DNA sequencing, or by average measurements from a large sample of mature spores, keeping in mind that number of spores in asci results in different measurements, and must be taken into account. Table 1 summarizes spore dimensions for the four members of the *T. gibbosum* complex. *Tuber*

gibbosum is typically larger and has longer spores than *T. castellanoi*. *Tuber oregonense* and *T. bellisporum* have narrower, ellipsoid, subfusoid to oval spores. *Tuber oregonense* is also more likely to have an orange to reddish orange exterior. All these species are typically found in association with Douglas-fir, but also occur rarely with other members of the Pinaceae. Another *Tuber* species in California is *T. californicum*, which has a very firm, irregularly lobed, pubescent fruit body that is whitish to tan when young, becoming ochre-brown to brown in age. It also has a marbled, whitish to dark brown gleba with whitish veins, an herbal garlic-cheese odor, and globose spores. It is common in the late winter and spring under oaks and conifers. *Tuber candidum* has a round fruit body with a reddish brown exterior, a tan to orange-brown gleba marbled with dark brown and white veins, and a mild to earthy odor. *Balsamia magnata* has an orangish, distinctly pimpled exterior, a marbled white interior, and smooth ellipsoid spores.

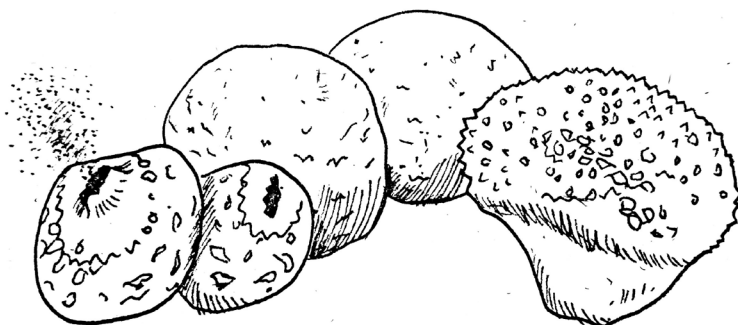
Photo: © James Trappe.

Table 1.
Spore-size comparison for the members of
the *Tuber gibbosum* complex

SPECIES	1-SPORED ASCI		2-SPORED ASCI		3-SPORED ASCI		4-SPORED ASCI	
	Sp. Size μm	Q	Sp. Size μm	Q	Sp. Size μm	Q	Sp. Size μm	Q
<i>T. gibbosum</i>	36-60 x 25-37.5	1.2-1.8	28.5-50 x 20-37.5	1.1-1.8	25-50 x 16-32.5	1.2-1.9	22.5-38 x 17-30	1.1-1.8
<i>T. castellanoi</i>	33-44 x 24-38	1.0-1.6	24-40 x 20-36	1.0-1.5	24-36 x 20-30	1.0-1.4	20-35 x 18-28	1.0-1.4 (1.6)
<i>T. bellisporum</i>	27-55 x 16-32	(1.0) 1.3-2.1	24-45 x 15-22	1.2-2.1	24-38 x 16-25	1.2-1.9	20-36 x 14-22	(1.1) 1.3- 1.8 (2.0)
<i>T. oregonense</i>	42-62.5 x 17.5-30	1.5-2.5 (2.9)	32.5-50 x 15-25	1.5-2.4	27.5-45 x 15-25	1.5-2.0 (2.45)	25-38.5 x 13-28	1.4-2.2 (2.3)

Q is the length/width ratio of a spore (a globose spore would have a Q of 1.0).

PUFFBALLS



Bovista californica

Kreisel

COMMON NAME:

SPECIES CODE:



FAMILY: Agaricaceae

SYNONYMS: None

SUMMARY: A small to tiny puffball with a tuft or pad of basal mycelium, and a tomentose to finely floccose exoperidium that breaks up into pale small scales, giving it a spotted or mottled appearance. Although many California puffballs resemble this species, few are routinely this small. This, along with the often-gregarious fruiting on the edges of alpine lakes and seeps in meadows, along with microscopic features help distinguish it. Known from nine sites in western North America, six of which are in California.

TAXONOMIC NOTES: This puffball was described by Kreisel (1967) from Hat Lake, Lassen Volcanic National Park. Jarvis (2014) noted that *Bovista californica* and the European *B. limosa* are very closely related based on ITS phylogenetic analysis and suggested that they may be synonymous, while noting slight morphological differences. Additional work is needed to see if *Bovista californica* is a distinct species.

DISTRIBUTION: Occurring on the edges of alpine lakes and seeps in the Sierra

Nevada and San Bernardino Mountains, with a single site in the Cascade Range in California. Also known from one site each in Oregon, Washington and Wyoming. A reported Idaho record is questionable. **USA:** **CA:** **Shasta Co.**, LVNP, Hat Lake (Type). **Plumas Co.**, PNF, Davis Lake, Jenkins cove. **Alpine Co.**, StaNF, Lake Alpine. **Mono Co.**, INF, Ellery Lake. INF, Green Treble Lake. **San Bernardino Co.**, Camp Osceola. **OR:** 1 site. **WA:** 1 site. **WY:** 1 site.

DESCRIPTION: **FRUIT BODY** 0.5–1.5 (2) cm across, 0.4–0.8 cm tall, typically rounded, or depressed slightly at top, developing a slit, star-like, round to oval ostiole when mature. Base with tuft of mycelial threads, or mycelial pad with incrustated soil. **EXOPERIDIUM** whitish at first, becoming cream-buff to gray-brown when mature. Tomentose to finely floccose, becoming more furfuraceous and powdery, wearing off easily as it matures, fragmenting into flocculose warts with age. **ENDOPERIDIUM** thin, dull, typically slightly darker colored than exoperidium. **GLEBA** firm to soft, cream-white when young, becoming grayish yellow to brown buff; dark brown and powdery when mature. Subgleba remaining cream colored, diaphragm absent. **MICROSCOPY:** **Spores** (3) 4–6.5 x 3.5–6 μm , subglobose to broadly ellipsoid, roughened with flattened warts, thick-walled, golden to rusty brown in KOH. Pedicel short, 2–6 μm long, ends roughly broken. **Eucapillitium** intermediate-type, threads 2–7.5 μm across, walls up to 0.8 μm thick, smooth, non-elastic and readily breaking; threads straight, with frequent dichotomous branching and occasional knob-like projections; tips attenuate. Pores rare, round and very small when present. Septa rare, found near the center of the gleba, or absent. **Paracapillitium** abundant, incrustated with cellular debris, thin, hyaline, septate. **Exoperidium** composed of densely layered, thin-walled, swollen, globose cells. **Endoperidium** composed of tightly intertwined, thin-walled, septate, hyphal threads.

ECOLOGY: Saprotrophic; growing in humus and rich or sandy soil, often on the shores of alpine lakes, riparian zones and seeps in meadows. Often in clusters or groups, rarely solitary, fruiting in summer and early fall.

SIMILAR SPECIES: *Bovista sierraensis* is another small puffball that grows in sandy soil on the banks of alpine lakes. It has a tomentose to scurfy coating (more granular when young), which rubs off readily. This surface, soon cracking as it matures, peels away in patches to expose the endoperidium. Microscopically, it has roughened, globose spores; 4–8.8 (9.6) μm , averaging 6.8 x 6.5 μm , with a broken pedicel, 0.8–1.6 μm long. A common species (especially in disturbed areas) is *Bovista aestivalis*, which is larger (1–4 cm across), typically has a thick mycelial cord at the base, and a tomentose to flocculose-granulose exoperidium, which readily rubs off, cracking in a checkered-like pattern and sloughing off in flakes

in age, exposing a smooth endoperidium. Microscopically, it has smooth to finely warted, globose to subglobose spores, $3.5\text{--}6 \times 3.5\text{--}5 \mu\text{m}$. *Bovista plumbea* has a matted-tomentose to nearly smooth surface, scuffing away to expose a smooth, shiny inner skin. Microscopically, it has nearly smooth, ovoid spores $5\text{--}6.5 \times 4\text{--}5.5 \mu\text{m}$, with a long pedicel, $7.5\text{--}11.5 \mu\text{m}$ long. *Bovista pila* is very similar to *B. plumbea*, but has globose to broadly ellipsoid, roughened spores, $(3.2) 4\text{--}5.6 \times (3.2) 4\text{--}5.5 \mu\text{m}$.

Photo: © Fred Stevens.

Calvatia lloydii

Zeller & Coker

COMMON NAME:

SPECIES CODE:



FAMILY: Agaricaceae

SYNONYMS: *Handkea lloydii* (Zeller & Coker) Kreisel

SUMMARY: A small puffball with a tuft or pad of basal mycelium, and a scurfy surface when young that cracks into octagonal scale-like warts or patches with flattened to obtuse spines as it matures. Microscopically, the spores are globose, finely roughened, and thick-walled, averaging 4 μm across. Known from 12 sites in California, as well as two in Oregon and two in Idaho. Only a single new collection location has been reported in California since 1976. Many species look macroscopically similar; microscopic examination is necessary for positive identification.

TAXONOMIC NOTES: Described by Zeller (1947) from SNP, California. Based on initial phylogenetic analysis (Jarvis 2014) this species belongs in the genus *Lycoperdon*, but additional study is needed to support that conclusion.

DISTRIBUTION: Occurring in high-elevation forests in the Sierra Nevada and San Bernardino Mountains, with a single site in the Cascade Range in California. Most California sites are close to each other in Sequoia National Park. Also known from

two sites in the Oregon Cascades and two sites in Idaho. **USA: CA: Plumas Co.**, LVNP, Juniper Lake. **Nevada Co.**, TNF, White Cloud Campground. **Tuolumne Co.**, StaNF, location unknown. StaNF, Sonora Pass, 10 miles up Herring Creek Road. YNP, Crane Flat. **Tulare Co.**, SNP, near Halstead Meadow (Type). SNP, Crescent Meadow. SNP, Giant Forest Park headquarters area. SNP, Suwannee Grove. SNP, Giant Grove, Moro Rock Trail. **San Bernardino Co.**, SBNF, Camp Oongo, near Running Springs. Camp Osceola. **OR: 2 sites. ID: 2 sites.**

DESCRIPTION: FRUIT BODY 1–8.5 cm across, 1–7.2 cm tall, typically rounded, less often cushion-shaped or top-shaped, occasionally flat or depressed on top. Base with a tuft of mycelium or a mycelial pad, often incrustated with soil. Surface scurfy when young, cracking into octagonal scale-like warts or patches with flattened to obtuse spines. White to cream when young, darkening to clay colored to dark yellowish brown, then dark red-brown in age. Inner skin similarly colored, smooth, breaking away to expose the spores at apex in age. **GLEBA** white to cream and firm when young, becoming clay colored to olive brown then dark brown and soft, cottony when mature. Sterile base cup-shaped, white to cream, brown to grayish brown when mature. **MICROSCOPY: Spores** 4 x 4 μm , globose, finely roughened, thick-walled, golden brown in KOH. **Eucapillitium** threads 2.4–7.2 μm across, with walls up to 1 μm thick, fragile, fragmenting, breaking unevenly. Long threads straight, with dichotomous branching, smooth. Thinner hyphal threads slightly sinuous, knob-like projections present; threads with attenuated to blunt round ends, some ends bulbous or swollen; pores abundant, round punctate, slit-like, with cracks. **Paracapillitium** absent. **Exoperidium** composed of tightly packed deflated cells. **Endoperidium** composed of entangled hyphae, with thick, branched walls and round bulbous ends.

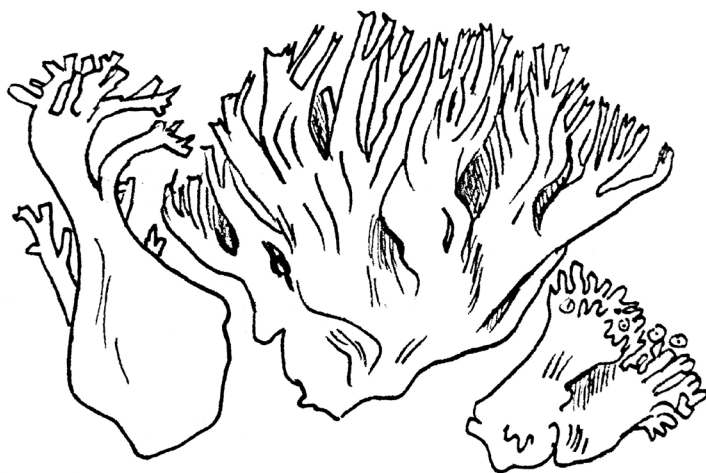
ECOLOGY: Saprotrophic in duff under firs (*Abies* spp.) and pine (*Pinus* spp.). Fruiting solitary or scattered in spring after snowmelt, or in summer with monsoon rains, occasionally in fall.

SIMILAR SPECIES: *Calvatia fumosa* is very common in montane forest in spring, often buried in duff, hidden or partially exposed. It differs by having a smooth to cracked, rather thick skin, whitish, light brown to gray-brown in color, an often-disagreeable odor (like rotting eggs) when maturing, and spiny, globose spores; 4.8–6.4 μm , averaging 5.1 μm , with a short pedicel. *Lycoperdon subcretaceum* has a white, rounded, cushion to top-shaped fruit body, finely cottony when very young, soon entirely covered in short blunt to pointed yellowish to brownish warts. Microscopically, it has very finely roughened to warty, globose to subglobose spores; 4–5.6 μm . *Lycoperdon vernimontanum* has a rooted fruit body with distinct

rhizomorphs, a scurfy-spiny surface when young, cracking in age, and spiny, globose spores, 6 μm across. *Bovista plumbea* has a matted-tomentose surface, scuffing away to expose a smooth, shiny inner skin. Microscopically, it has nearly smooth, ovoid spores 5–6.5 x 4–5.5 μm , with a long pedicel, 7.5–11.5 μm long. *Bovista pila* is very similar to *B. plumbea*, but has globose to broadly ellipsoid, roughened spores, (3.2) 4–5.6 x (3.2) 4–5.5 μm . *Bovista sierraensis* is a small species that grows on the banks of alpine lakes in sandy soil. It has a tomentose to scurfy surface, with a granular covering when young (which rubs off readily), soon cracking as it matures, then peeling away in patches to expose the endoperidium. Microscopically, it has roughened, globose spores, 4–8.8 (9.6) μm , averaging 6.8 x 6.5 μm , pedicel broken, 0.8–1.6 μm long. *Bovista californica* is an even smaller species (under 2 cm across), typically fruiting in wet meadows or lake shores. It has globose, subglobose, to broadly ellipsoid, roughened spores (3) 4–6.5 x 3.5–6 μm .

Photo: © Ron Pastorino.

CORAL FUNGI



Ramaria amyloidea

Marr & D.E. Stuntz

COMMON NAME:

SPECIES CODE: RAAM4



FAMILY: Gomphaceae

SYNONYMS: None

SUMMARY: A medium to large coral fungus with pallid orangish to reddish tinged branches, yellowish to orangish tips, a chunky whitish stipe, a green reaction to iron sulfate and strongly amyloid flesh (turning violet-brown in Melzer's reagent). Microscopically, it has relatively small, nearly smooth spores ($8.9 \times 3.6 \mu\text{m}$) and clamped basidia. Very rare in California; so far only known from the Klamath Range, but potentially more widespread in the state. Known from ~45 sites in the Pacific Northwest and northern Rocky Mountains in Idaho.

TAXONOMIC NOTES: Described by Marr and Stuntz (1973) from the central Washington Cascades. Field identification of *Ramaria* species is often difficult, with macromorphological differences being subtle and often intergrading (especially in older fruiting bodies). Developing a field sense for this species can take time but, at least in this case, confirmation of the identification is based on macro-chemical reactions and distinctive microscopy.

DISTRIBUTION: Known from a single site in California, the Marble Mountains in

the Klamath Range. Occurring from the Coast Range to the Cascades in Oregon and Washington, and in the Rocky Mountains in Idaho. **USA: CA: Siskiyou Co.**, KNF, Stanishaw Trail. **OR:** 20+ sites. **WA:** 15+ sites. **ID:** 10 sites.

DESCRIPTION: **FRUIT BODY** 7–15 cm across, 7–13 cm tall, stipe typically very stout, branches compact, lower branches often thick, with short upper sections. Tips yellow, light orange, pinkish, or with red tinges. Branches pallid orange, with tinges of pale red, occasionally with violet-gray bruises. **STIPE** 2–6.5 cm long, 2–4 cm thick, stout, stocky, equal or tapering towards base. Whitish to cream when young, developing brown stains, to mostly brown in age. **FLESH** fibrous to stringy, reddish to orangish white in branches, whitish in stipe, with brownish bands, brown from base up. **ODOR** indistinct to slightly sweet. **TASTE** indistinct. **CHEMICAL REACTIONS:** Flesh quickly amyloid (turning violet-brown in Melzer's reagent); turquoise green in FeSO_4 . **SPORE DEPOSIT** apricot yellow. **MICROSCOPY:** **Spores** 7–10 x 3–4 μm , averaging 8.9 x 3.6 μm , narrowly cylindrical, nearly smooth, or with weak ornamentation. Basidia with basal clamps.

ECOLOGY: Ectomycorrhizal with conifers, especially fir (*Abies* spp.), Western Hemlock (*Tsuga heterophylla*), and Douglas-fir (*Pseudotsuga menziesii*). Likely restricted to old-growth stands. Solitary or scattered on the ground, fruiting in fall.

SIMILAR SPECIES: *Ramaria celerivirescens* has salmon-colored branches, and typically, brighter yellow tips when young (although soon becoming the same color as *R. amyloidea*). It can be distinguished by its weakly amyloid flesh, lack of clamps on the basidia, and distinctly warted spores. *Ramaria velocimutans* is white or cream to yellowish in color, with brownish stains on the stipe, and with brown flesh in the stipe. It is easily distinguished from *R. amyloidea* by its inamyloid flesh and finely warted spores. *Ramaria rasilispora* and *R. magnipes* are yellow, lack the brown flesh in the stipe, and have larger spores. *Ramaria maculatipes* can also look similar, but soon develops wine-red stains on the stipe.

Photo: © Michael Beug.

Ramaria aurantiisiccescens

Marr & D.E. Stuntz

COMMON NAME:

SPECIES CODE: RAAU3



FAMILY: Gomphaceae

SYNONYMS: None

SUMMARY: A small to medium coral fungus whose bright orange tips, orange upper branches, and yellow band around the lower branches and upper stipe, fleshy-fibrous stipe flesh, finely warted spores and lack of clamp connections on the basidia help distinguish it. The orange tips (most similar species have yellow tips), lack of gelatinous flesh and relatively long spores are also important features. Currently known from two sites in California, and ~45 locations in the Pacific Northwest and northern Rocky Mountains.

TAXONOMIC NOTES: Described by Marr and Stuntz (1973) from Washington. Field identification of *Ramaria* species is often difficult, with macromorphological differences being subtle and often intergrading (especially in older fruiting bodies). Developing a field sense for this species can take time.

DISTRIBUTION: Known from two sites in California: one in the Coast Range, and one in the Marble Mountains in the Klamath Range. Occurring from the Coast Range to the Cascades in Oregon and Washington, north into southern British

Columbia, and in the Rocky Mountains in Idaho and Colorado. **USA: CA: Humboldt Co.**, Arcata, Fickle Hill Road. **Siskiyou Co.**, KNF, Haypress Meadows. **OR:** 23 sites. **WA:** 12 sites. **ID:** 1 site. **CO:** 1 site. **CANADA: BC:** 2 sites.

DESCRIPTION: **FRUIT BODY** 2–8 cm across, 8–10 cm tall, base simple to nearly compound, branches typically slender, compact at first, becoming rather upright. Tips dark orange, fading slightly with age. Branches pale orange to orange-yellow, with a yellow band around the lower branches and upper stipe. **STIPE** 1–4 cm long, 1–2 cm thick, short to slightly rooted. Base white, upper portion with a yellow band, occasionally with caramel-brown stains. **FLESH** fleshy-fibrous, (not gelatinous), whitish in stipe, branches orangish, tips bright orange. **ODOR** indistinct to slightly sweet. **TASTE** indistinct. **CHEMICAL REACTION:** Flesh inamyloid. **SPORE DEPOSIT** scant, unknown color. **MICROSCOPY:** **Spores** 8.5–14 x 3–5 μm , averaging 10.8 x 4 μm , cylindrical to nearly tear-drop shaped, ornamented with fine warts. **Basidia** lacking basal clamps.

ECOLOGY: Solitary or scattered on ground; ectomycorrhizal with conifers; especially fir (*Abies* spp.), Western Hemlock (*Tsuga heterophylla*), and Douglas-fir (*Pseudotsuga menziesii*). Fruiting in fall.

SIMILAR SPECIES: *Ramaria gelatiniaurantia* also has orange tips and branches, and a yellow band at the stipe apex, but has distinctly gelatinous flesh. *Ramaria sandaracina* is typically more brightly colored with bright orange to orange-yellow tips, orange upper branches, and a bright yellow band on the lower branches. It has fibrous-fleshy or slightly gelatinous flesh, shorter (8 μm) papillate-warted spores, and has clamp connections. *Ramaria flavigelatinosa* has bright yellow tips, yellow branches, and firm gelatinous flesh. *Ramaria armeniaca* is a spring fruiting species with bright orange tips, apricot-colored branches, and occasionally shows a pale-yellow band on the lower branches and upper stipe. It can easily be distinguished from *R. aurantiisiccescens* by its vernal fruiting, and slightly shorter, nearly smooth spores.

Photo: © Kit Scates.

Ramaria coulterae

Scates

COMMON NAME:

SPECIES CODE: RACO18



FAMILY: Gomphaceae

SYNONYMS: None

SUMMARY: A spring-fruiting coral fungus with reddish to pinkish tips, pale pinkish to whitish branches, a chunky white stipe which slowly discolors brownish when handled, and white flesh with a rusty band. Microscopically, it differs from other pinkish spring-fruiting species by having nearly smooth to low-warted spores and basidia which lack clamps.

TAXONOMIC NOTES: Described by Scates (Petersen & Scates 1988), from Idaho. Field identification of *Ramaria* species is often difficult, with macromorphological differences being subtle and often intergrading (especially in older fruiting bodies). Developing a field sense for this species can take time.

DISTRIBUTION: Known from 25+ locations in the Sierra Nevada and Cascade Range in California, the Oregon Cascades and the Rocky Mountains of Idaho. Also reported from Colorado, although the identity of these collections should be confirmed. **USA: CA: Siskiyou Co.,** S-TNF, 1 mile southeast of Red Tank Spring. S-TNF, Raccoon Creek. S-TNF, Algoma. S-TNF, Bartle Creek. MoNF, Yellow-

jacket Butte. MoNF, Black Mountain. **Sierra Co.**, TNF, Lincoln Creek Campground.

OR: 10 sites. **ID:** 10 sites. **CO:** 1 site.

DESCRIPTION: **FRUIT BODY** 5–12 cm across, 4–12 cm tall, forming large clusters with a thick, chunky stipe. Branches relatively short, elongating somewhat in age. Tips reddish brown, upper branches reddish to pinkish buff, fading to pale pinkish, then buff in age. Branches pale pinkish to whitish at first, developing buff tones as spores mature. **STIPE** 3–8 cm tall, 2–6 cm thick, quite chunky, rounded or slightly tapered towards base. White to off-white, slowly staining brownish when bruised. **FLESH** thick, firm, fibrous in stipe, branches brittle. White to off-white, usually with brownish fan-shaped area when cut longitudinally. **ODOR** indistinct. **TASTE** mild. **CHEMICAL REACTIONS:** Flesh inamyloid, FeSO_4 negative. **SPORE DEPOSIT:** ochre-buff. **MICROSCOPY:** **Spores** 8.3–12.6 x 2.9–4 μm , averaging 9.95 in length; narrowly ellipsoid to cylindrical, smooth or ornamented with few ill-defined, low cyanophilous warts. **Basidia** lacking clamps.

ECOLOGY: Solitary, scattered, or in troops on ground under conifers. Ectomycorrhizal, likely associating with a variety of species in the Pinaceae. Fruiting in spring soon after snowmelt, continuing into early summer in years with spring rains.

SIMILAR SPECIES: *Ramaria rubripermanens* is a large, chunky, typically spring-fruiting species with pink to red branch tips when young that fade to dull rosy pink, a large, white unstaining stipe, and amyloid flesh. Microscopically, it has clamps at the base of the basidia, and longitudinally striate spores. *Ramaria rubrievanescens* is a large, chunky, typically fall-fruiting species with pinkish tips when young that quickly fade to beige, and then darken to ochre-buff as the spores mature. It also has amyloid flesh, longitudinally striate spores and clamps at the base of the basidia. *Ramaria vinosimaculans* has yellowish tips, whitish branches and a white stipe that develops wine-red stains. *Ramaria botrytis* is a pink-tipped, fall-fruiting species with amyloid flesh, and twisted-striate spores.

Ramaria cyaneigranosa

Marr & D.E. Stuntz

COMMON NAME:

SPECIES CODE: RACY2



FAMILY: Gomphaceae

SYNONYMS: None

SUMMARY: A small to medium coral fungus with pinkish to yellowish pink tips, light red, pink to peachy-pink branches, a somewhat slender stature, and non-amyloid stipe flesh. Microscopically, the coarsely ornamented spores, and basidia with abundant cyanophilous granules, and lack of clamp connections at the basidia base help distinguish this species. Currently known from five sites in California, and approximately 60 sites in the Pacific Northwest.

TAXONOMIC NOTES: Three varieties of *Ramaria cyaneigranosa* have been described; all three should be collected, and details of their morphology and habitat carefully recorded. They are separated based on color, form, and spore size. *Ramaria cyaneigranosa* var. *cyaneigranosa* is described in full below. *Ramaria cyaneigranosa* var. *elongata* has a slender, spindly habit and reddish tips (never yellow), and spores 8–10 x 4–5 μm (averaging 9.2 x 4.5 μm). *Ramaria cyaneigranosa* var. *persicina* has peach or salmon-colored branches and tips (occasionally minutely yellow-dotted), and spores measuring 7–11 x 3.5–6 μm (averaging 9.6 x 4.7 μm).

DISTRIBUTION: Known from five sites in California, most of which are coastal, with a single record from eastern S-TNF in the southern Cascades. Also known from ~60 sites from the Coast Range to the Cascades in Oregon and Washington, with a single record from Idaho. **USA: CA:** (No variety details are listed for any of the California collections; all are presumed to be var. *cyaneigranosa*) **Del Norte Co.**, Jedediah Smith Redwoods State Park. **Humboldt Co.**, Big Lagoon. Big Hill Rd. Lord Ellis Summit. **Siskiyou Co.**, S-TNF, near Harris Spring. **OR:** 7 sites for var. *cyaneigranosa*; 9 sites for var. *elongata*; 14 sites for var. *persicina*; 11 sites, no variety listed. **WA:** 4 sites for var. *cyaneigranosa*; 3 sites for var. *elongata*; 4 sites for var. *persicina*; 7 sites, no variety listed. **ID:** 1 site, no variety listed. **CANADA: BC:** 2 sites (identification highly questionable).

DESCRIPTION: FRUIT BODY 2–12 cm across, 4–12 cm tall, stipe slender to slightly bulbous, branches upright, slender, crown typically narrow. Tips light red, shell-pink, salmon to peach-pink; usually with light yellow to reddish yellow at extreme top. Branches light red, pinkish to salmon, fading slightly with age. **STIPE** 0.5–4 cm tall, 0.4–3 cm thick, equal to bulbous above, often rooted below, simple to subcompound. White on lower portions, transitioning to pinkish. **FLESH** fleshy-fibrous, pale red to pinkish in branches, whitish in stipe. **ODOR** indistinct. **TASTE** indistinct. **CHEMICAL REACTIONS:** Flesh inamyloid, no reaction to FeSO_4 . **SPORE DEPOSIT** scant, unknown color. **MICROSCOPY: Spores** 8–15 x 4–6 μm , averaging 11 x 4.6 μm , subcylindrical, ornamented with scattered cyanophilous warts. **Basidia** lacking basal clamps, containing cyanophilous granules.

ECOLOGY: Solitary or scattered on ground; ectomycorrhizal with a wide range of conifers. Fruiting in fall.

SIMILAR SPECIES: *Ramaria araiospora* var. *rubella* is crimson red to neon pink when young, fading slightly in age to reddish pink or pink; these brighter colors are typically enough to distinguish it. *Ramaria araiospora* var. *araiospora* is very similar to *R. araiospora* var. *rubella*, but the tips turn orange to yellow in age; such fruit bodies are difficult to distinguish from *R. cyaneigranosa*. Microscopically, both varieties of *R. araiospora* lack the cyanophilous granules in the basidia, and have finely warted spores which are much narrower, measuring 9.9 x 3.7 μm on average. *Ramaria stuntzii* is typically brighter neon pink when young, becoming bright red to orange-red. It has a large, often chunky white stipe, distinctly amyloid flesh, and smaller spores (7–10 x 3–5 μm).

Photo: US Forest Service/Wendy Boes.

Ramaria largentii

Marr & D.E. Stuntz

COMMON NAME:

SPECIES CODE: RALA10



FAMILY: Gomphaceae

SYNONYMS: None

SUMMARY: A medium to large fall-fruiting coral fungus with bright orange tips and orange branches that become ochre-orange with age, fibrous flesh, long coarsely ornamented spores, and basidia with basal clamps that help distinguish it. Currently known from four sites in California, 30+ in Washington and Oregon, and 15 in the Rocky Mountains.

TAXONOMIC NOTES: Described by Marr and Stuntz (1973) from Mt. Rainier National Park, Washington. The variety *Ramaria largentii* var. *citrina* was described from Switzerland; it likely represents a distinct species. Collections from the Rocky Mountain are more golden in color; these collections should be compared with collections from the Pacific states.

DISTRIBUTION: Known from four sites in California on the North Coast and in the southern Cascades and central Sierra. Occurring from the Coast Range to the Cascades in Oregon and Washington, with additional records from the Rocky Mountains. Also reported from eastern North America and Europe. **USA:** CA:

Mendocino Co., School Bus Woods off Compeche Rd. **Siskiyou Co.**, KNF, Haypress Meadows. Shasta Trinity National Forest, Trout Creek. MoNF, Double Head Road. **Tuolumne Co.**, YNP, Yosemite Valley. **OR**: 21 sites. **WA**: 10 sites. **ID**: 4 sites. **WY**: 1 site. **CO**: 9 sites. **CANADA**: **AB**: 1 site.

DESCRIPTION: **FRUIT BODY** 7–14 cm across, 12–15 cm tall, medium to large, broad, often with spreading clusters of leggy, upright branches arising from a chunky cylindrical or broadly obconic stipe. Tips brilliant orange, fading to orange, then ochre–orange in age. Branches bright orange, fading slightly, and becoming ochre–orange when spores mature. **STIPE** 3–5 cm across, 2–6 cm tall, single to somewhat clustered, cylindrical or broadly conic. Base white to pale yellow, upper portion orange. **FLESH** fleshy-fibrous. White in stipe and center of branches, orange in tips and in outer part of branches. **ODOR** mild to sweet. **TASTE** indistinct. **CHEMICAL REACTIONS:** Flesh inamyloid, no reaction in FeSO_4 . **SPORE DEPOSIT** golden yellow. **MICROSCOPY:** **Spores** 11–15 x 3.5–5 μm , averaging 13.4 x 4.5 μm , subcylindrical, ornamented with distinct cyanophilous warts, often in sub-spirals. **Basidia** with basal clamps.

ECOLOGY: Solitary or scattered on ground, fruiting in fall; ectomycorrhizal with a wide range of conifers. California collections have been under pine (*Pinus* spp.) and fir (*Abies* spp.) in both coastal and montane old-growth forests.

SIMILAR SPECIES: *Ramaria distinctissima* var. *americana* has brighter colors, with bright orange tips, pinkish to salmon-colored upper branches, and yellow to golden yellow lower branches. It has long (12.6–16.3 x 4.8–6.3 μm), ellipsoid to nearly boletoid spores with distinct cyanophilous warts. *Ramaria longispora* is a tall, slender species with yellow tips and orange branches, a bright yellow band on the upper stipe, long spores (13.5 x 4.5 μm), and which lacks clamps. *Ramaria gelatinaurantia* also has orange tips and branches and a yellow band at the stipe apex but has distinctly gelatinous flesh. *Ramaria sandaracina* typically has bright orange to orange–yellow tips, orange upper branches, and a bright yellow band on the lower branches. It has fibrous to slightly gelatinous flesh, and much shorter (8 μm) papillate-warted spores. *Ramaria flavigelatinosa* has bright yellow tips, yellow branches, and firm gelatinous flesh. *Ramaria armeniaca* is a spring-fruiting species with bright orange tips and apricot-colored branches, and usually lacks the pale yellow band on lower branches and upper stipe; it can easily be distinguished from *R. largentii* by its vernal fruiting, lack of clamps, and shorter, nearly smooth spores.

Photo: US Forest Service/Wendy Boes.

Ramaria maculatipes

Marr & D.E. Stuntz

COMMON NAME:

SPECIES CODE: RAMA10



FAMILY: Gomphaceae

SYNONYMS: None

SUMMARY: A medium-sized coral mushroom with a relatively short, compound to fasciculate stipe, and peach-colored branches with yellow tips and wine-red staining (especially on the stipe and lower branches). Other distinctive features include the amyloid reaction of the flesh, clamp connections at the base of the basidia, and subcylindrical spores ornamented with fine warts. California records are coastal and from the Klamath Range.

TAXONOMIC NOTES: Described by Marr and Stuntz (1973) from Washington. Field identification of *Ramaria* species is often difficult, with macromorphological differences being subtle and often intergrading (especially in older fruiting bodies). Developing a field sense for this species can take time.

DISTRIBUTION: Rather uncommon and spotty in California; occurring from coastal Mendocino County north through the Klamath Range. From the coast to the Cascades in Oregon and Washington, as well as in the Rocky Mountains of Idaho.

USA: CA: Siskiyou Co., S-TNF, location unknown. KNF, Haypress Meadows.

Mendocino Co., Jackson State Forest, near Mendocino. Jackson State Forest, eastern side. **OR:** 15 sites. **WA:** 5 sites. **ID:** 4 sites.

DESCRIPTION: **FRUIT BODY** 4–10 cm across, 5–10 cm tall, multi-branched from a simple, compound to fasciculate base, branches compact at first, relative upright and leggy in age. Tips yellow to ochre-yellow. Branches peach-colored to peachy orange. Staining wine-red to blood-red on stipe and lower branches. **STIPE** 2–4 cm long, 1.5–3 cm thick, simple to fused, often somewhat rooted. Whitish to orangish white, staining wine-red to blood-red. **FLESH** relatively thin, fleshy-fibrous, white to peachy orange, with red stains in stipe. **ODOR** indistinct. **TASTE** mild to slightly bitter. **CHEMICAL REACTIONS:** Flesh very slowly amyloid, FeSO_4 negative. **SPORE DEPOSIT** ochre-buff. **MICROSCOPY:** **Spores** 9–11 x 4–5 μm , averaging 10.2 x 4.3 μm , subcylindrical, ornamented with fine warts in sub-spirals. **Basidia** with basal clamps.

ECOLOGY: Solitary or scattered on ground, fruiting in fall. Ectomycorrhizal with conifers, especially true firs (*Abies* spp.), Western Hemlock (*Tsuga heterophylla*), and Douglas-fir (*Pseudotsuga menziesii*). Likely restricted to old-growth forests.

SIMILAR SPECIES: *Ramaria rubiginosa* also has wine-red stains on the stipe but differs by having pale creamy yellow tips and branches (lacking the peach tones). *Ramaria rubribrunnescens* has reddish to salmon-pink branches with reddish tips when young that become more orange-brown with age, wine-red stains on the lower branches and stipe, and has inamyloid flesh. Microscopically, it lacks clamped basidia, and has longer, finely ornamented spores measuring 10–14 x 3.5–5 μm . *Ramaria vinosimaculans* has ivory to cream-colored branches and yellowish tips when young, and burgundy stains on the lower branches and stipe. Besides the paler colors, the longer spores, 11.2–14 x 4.3–5 μm , and inamyloid flesh help distinguish it. *Ramaria formosa* is very similar in color, but lacks the wine-red stains, has inamyloid flesh, and has coarsely warted spores.

Photo: © Ron Exeter.

Ramaria purpurissima

R.H. Petersen & Scates

COMMON NAME:

SPECIES CODE:



FAMILY: Gomphaceae

SYNONYMS: None

SUMMARY: A large, grape-purple coral fungus with a chunky lilac-purple to whitish stipe that develops rusty stains, and white flesh. No other coral fungus in California shares these characteristics. Very rare in California; currently known from two sites in Mendocino National Forest just south of the Yolla Bolly Wilderness, and one from western Shasta-Trinity National Forest, near Corral Bottoms.

TAXONOMIC NOTES: Described by Petersen & Scates (Petersen 1987) from Idaho. *Ramaria purpurissima* var. *gigantea* (K.S. Thind & Anand) R.H. Petersen pertains to a species from India and southeast Asia; it is undoubtedly distinct from the western North American species.

DISTRIBUTION: Known from 11 locations; three in California, seven from southwest Oregon, and two from Idaho. This is a remarkably small number of collections given how distinctive this species is. **USA: CA: Trinity Co.,** S-TNF, Corral Bottoms. **Mendocino Co.,** MeNF, Croney Ridge. MeNF, Green Spring. **OR: Curry Co.,** Bureau of Land Management, Coos Bay District, Bravo Creek. **Douglas Co.,** near

Emerson Ridge. Umpqua National Forest, Tiller Ranger District. **Jackson Co.**, Cascade-Siskiyou National Monument, Green Spring. **Klamath Co.**, Winema National Forest, Pothole Butte. **Lane Co.**, Umpqua National Forest, Cottage Grove Ranger District, Brice Creek Trail. Umpqua National Forest, North Umpqua Ranger District. **ID: Kootenai Co.**, Coeur d'Alene National Forest, Birdhouse Hill (Type). Panhandle National Forest, Bighorn Hill.

DESCRIPTION: **FRUIT BODY** 5–15 cm across, 8–10 cm tall, crown rather compact, primary branches thick, secondary branches short, forking at tips. Tips grape-juice purple to amethyst purple. Branches similarly colored, or slightly duller, fading somewhat, but retaining the purple color, and developing ochre tones from mature spores in age. **STIPE** 3–9 cm tall, 2–5 cm thick, chunky, rounded. White with lilac-purple tones towards the branches, often with rusty stains in age. **FLESH** thick, firm, stringy in stipe and branches, tips fragile. White, with rusty brown stains in stipe. **ODOR** indistinct. **TASTE** mild to slightly bitter. **CHEMICAL REACTIONS:** Flesh inamyloid, negative in FeSO_4 , KOH purple-red on purple areas. **SPORE DEPOSIT** ochre-buff. **MICROSCOPY:** **Spores** 9–11.2 x 4.7–5.4 μm , averaging 10.3 in length; ellipsoid with adaxial bulge, conspicuously roughened with complex low warts and short ridges. **Basidia** with basal clamps.

ECOLOGY: Solitary, scattered, or in troops on ground, fruiting in fall and early winter. In California, it is known from old-growth, mixed conifer forests dominated by Red Fir (*Abies magnifica*) and White Fir (*A. concolor*), with which it is presumably ectomycorrhizal.

SIMILAR SPECIES: The most likely species to cause confusion is an undescribed taxon in the *Clavaria zollingeri* group. It can be distinguished by its smaller size, brittle flesh, lack of a thick stipe, 2-spored basidia, and oval to elliptical spores. *Ramaria violaceibrunnea* is a smaller species with a slenderer upright crown and a distinctly differentiated stipe. The branches are violet when young, soon becoming smoky beige to grayish brown with a violet band on the upper stipe and lower branches, fading to grayish tan with age and developing ochre-yellow color from accumulated spores.

Ramaria rubripermanens

Marr & D.E. Stuntz

COMMON NAME:

SPECIES CODE: RARU6



FAMILY: Gomphaceae

SYNONYMS: None

SUMMARY: A medium-sized to very large coral fungus with pinkish to reddish tips and creamy or whitish branches, a fairly distinct, thick ‘trunk,’ striate spores and clamped basidia. Associated with conifers, fruiting both in spring and fall.

TAXONOMIC NOTES: Described by Marr & Stuntz (1973) from Washington. Field identification of *Ramaria* species is often difficult, with macromorphological differences being subtle and often intergrading (especially in older fruiting bodies). Developing a field sense for this species can take time. Fall fruiting collections of *R. rubripermanens* are very similar to *R. rubrievanescens*; microscopic examination is necessary for identification.

DISTRIBUTION: Known from 11 sites in California, mostly in the Klamath Range, occurring south into the Sierra Nevada, typically in areas above 300 m elevation. Common in Oregon, occurring north at least into Washington and Idaho. **USA:** **CA:** Siskiyou Co., KNF, Marble Mountain Wilderness, Stanshaw Trail. KNF, Stanshaw Trail, ~1 mi up trail. “Poison Oak Pond”. **Trinity Co.**, no specific loca-

tion given. **Mendocino Co.**, Jackson State Forest, junction of Road 408 and 409. Jackson State Forest, highway 20, milepost 10. MeNF, Willow Creek, near end of FR 23N24. **Tehama Co.**, MeNF, FR 24N01. MeNF, Croney Ridge. **Tuolumne Co.**, StaNF, Pinecrest. StaNF, Evergreen Road (photo only). **OR:** 100+ (currently known from 175 collections, locations of many are not listed). **WA:** 6 sites (four additional with no location information). **ID:** 7 sites.

DESCRIPTION: **FRUIT BODY** 5–10 (15) cm across, 8–20 cm tall, crown compact, primary ‘trunk’ thick, secondary branches relatively short and stout, tips branching. Tips extensively brick-reddish when young, or dingy dark pinkish to pale pink, fading to dull rosy pink. Many tips not fully developing, ‘abortive.’ Branches creamy to white with a pinkish tinge near tips becoming pinkish cinnamon as spores mature. **STIPE** 5–12 cm long, 5–9 cm thick, chunky, rounded, often with aborted branchlets on upper portion. White or pale cream. **FLESH** thick, firm, stringy in stipe and branches, tips brittle-crumblly, especially in age. **ODOR** indistinct, fragrant to musty sweet. **TASTE** mild to nutty. **CHEMICAL REACTIONS:** Flesh slowly amyloid, FeSO_4 negative. **SPORE DEPOSIT** ochre-buff. **MICROSCOPY:** **Spores** 10.5–15 x 4–5 μm , averaging 12.2 x 4.7 μm , ellipsoid, longitudinally striate. **Basidia** with basal clamps.

ECOLOGY: Solitary or in scattered troops, growing from soil; fruiting in late spring and fall. Ectomycorrhizal, in California, it is primarily known from old-growth forests of Douglas-fir (*Pseudotsuga menziesii*). In the Pacific Northwest, it is often found with other conifers, especially true firs (*Abies* spp.).

SIMILAR SPECIES: *Ramaria rubrievanescens* is very similar, but *R. rubripermanens* can be distinguished by more stable colors (without rapidly fading tips), and a non-browning stipe surface. *R. rubrievanescens* appears to be fall-fruiting only, thus spring collections matching this group are likely to be *R. rubripermanens*, given our current understanding. *Ramaria coulterae* has reddish to pinkish tips, pale pinkish to whitish branches, a chunky white stipe which slowly discolors brownish when handled, and white flesh with a rusty band. Microscopically, it differs from other pinkish spring-fruiting species by having nearly smooth to low-warted spores and basidia which lack clamps. *Ramaria botrytis* also has pinkish to reddish tips and whitish to creamy branches, but the pink colors quickly fade, and it has longer spores, measuring 11–17 x 4–6 μm .

Ramaria thiersii

R.H. Petersen & Scates

COMMON NAME:

SPECIES CODE: RATH3



FAMILY: Gomphaceae

SYNONYMS: None

SUMMARY: A medium-sized to large, spring-fruiting, coral mushroom; mostly found in high-elevation fir forests in the Sierra Nevada and southern Cascades. Recognized by its whitish or pale yellow to greenish yellow colors when young, pale ochre-yellow color in age, and chunky white stipe which stains brownish when damaged. Additionally, the inamyloid flesh, long spores, and clamped basidia help distinguish this species.

TAXONOMIC NOTES: Described by Petersen & Scates (Petersen 1988) from Tahoe National Forest, Sierra County, California. Field identification is difficult, as some specimens are difficult to distinguish from the *Ramaria rasilispora/magnipes* complex without microscopic examination.

DISTRIBUTION: Known from seven sites in California, ranging from the southern Cascades south into the central Sierra Nevada, as well as a single site on the North Coast. Also known from three sites in the Oregon Cascades, three sites in Idaho and a single site in British Columbia. **USA: CA: Mendocino Co.,** Jackson State

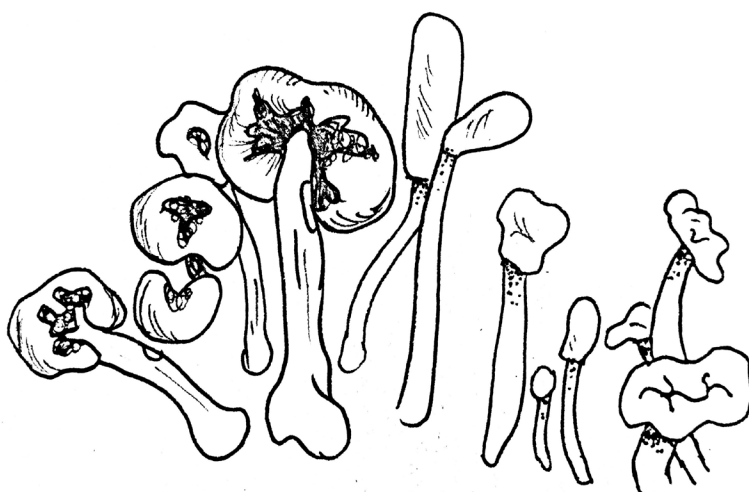
Forest. **Siskiyou Co.**, S-TNF, Mt. Shasta, Cold Creek. **Sierra Co.**, TNF, Lincoln Creek Campground (Type). TNF, junction of Weber Lake Road & Lincoln Valley Road, south of Yuba Pass. TNF, Vic Church Camp. TNF, Yuba Pass. **Tuolumne Co.**, YNP, South Fork Tuolumne River. **OR**: 2 sites. **ID**: 3 sites. **CANADA: BC**: 1 site.

DESCRIPTION: **FRUIT BODY** 3–8 cm across, 7–15 cm tall, stipe thick to massive, cylindrical, crown compact at first, often completely buried under duff, becoming more sparse and leggy in age. Tips whitish if under duff, pale yellowish, greenish yellow or straw-yellow when exposed. Branches whitish to pale yellow, to pale ochre-yellow when spores mature. **STIPE** 3–7 cm long, 2–6 (8) cm thick, triangular, narrowing towards base, to nearly cylindrical, often thick, chunky. White, at times with brownish stains in age. Slowly staining brownish when handled. **FLESH** thick, soft to spongy and white in stipe. Branches stringy-fibrous, white to pale salmon-yellow. **ODOR** indistinct. **TASTE** indistinct. **CHEMICAL REACTIONS:** Flesh inamyloid, FeSO_4 negative. **SPORE DEPOSIT** unknown. **MICROSCOPY:** **Spores** 11.6–15.8 x 4–5 μm , averaging 13.3 μm long, cylindrical to narrowly ellipsoid, obscurely roughened, and ornamented with small, low warts. **Basidia** with basal clamps.

ECOLOGY: Solitary or scattered on ground, often buried, forming “mushhumps” of pushed up duff. Ectomycorrhizal; likely with fir (*Abies* spp.). Fruiting in spring or early summer.

SIMILAR SPECIES: Members of the *Ramaria rasilispora/magnipes* complex typically have brighter yellow to greenish yellow tips and yellow to yellow-orange branches when young, a large, rounded to compact stipe, and white flesh. Paler or older specimens can be difficult to distinguish from *R. thiersii*. With experience, you may begin to be able to use stature differences: more upright, subcylindrical overall, with a triangular stipe in *R. thiersii*; more rounded and compact in the *R. rasilispora/magnipes* complex. Additionally, fruit bodies of the *R. rasilispora/magnipes* complex have slowly amyloid flesh, typically lack any brown staining (although this doesn't appear to be a reliably useful feature), and have smaller spores that are smooth, or are ornamented with a few slender ridges. *R. rasilispora/magnipes* are very common in spring and early summer in the California mountains, occurring with fir and pine. *Ramaria vinosimaculans* has ivory to cream-colored branches and yellowish tips when young, as well as burgundy stains on the lower branches and stipe. *Ramaria caulifloriformis* has dense, cauliflower-shaped fruit bodies with a large stem and lots of abortive branchlets at the apex, and pinkish beige to pinkish buff branches and tips.

CLUB FUNGI



Mitrula elegans

(Berk.) Fr.

COMMON NAME: Swamp Beacon

SPECIES CODE:



FAMILY: Helotiaceae

SYNONYMS: *Leotia elegans* Berk., *Microglossum elegans* (Berk.) Underwood

SUMMARY: A fungus with small fruit bodies easily recognized by their orange cylindrical heads, watery white stipe, and growth on needles, grass or sedge thatch and other small debris in standing water. In California, it is known from six voucher-confirmed locations, and two additional from photographic records in the Sierra Nevada, mostly in mid- to high-elevation wet meadows.

TAXONOMIC NOTES: DNA sequences of western North American collections need to be compared to ones from eastern North America, as the two may be different species. The name *M. paludosa* (a very closely related European species) has been misapplied to North American collections.

DISTRIBUTION: Known from scattered locations in the Sierra Nevada and Cascades, but rather rare in western North America. Common in eastern North America.

USA: **CA:** **Plumas Co.**, PNF, Butterfly Valley. **Sierra Co.**, TNF, “Mitrula Marsh” near Sand Pond. Sierra Valley. **El Dorado Co.**, ENF, near Secret House Campground (unconfirmed). Blodgett Forest, Agricultural Experimental Area near

Georgetown. ENF, Audrian Lake. **Tuolumne Co.**, YNP, Ireland Creek. **Fresno Co.**, SieNF, Dinkey Lakes Trail (unconfirmed). **OR:** Wasco Co., Mt. Hood National Forest, Skyline Rd. The Dalles. **Lincoln Co.**, Klickitat Lake. **Deschutes Co.**, Deschutes National Forest, Crescent District. **WA:** 10 sites. **ID:** 1 site. **MT:** 2 sites. **CANADA:** **BC:** 14 sites.

DESCRIPTION: **FRUIT BODY** 2–10 cm tall. **HEAD** 0.5–3 cm long, 0.3–1 cm across, cylindrical to rounded; rarely brain-like, ear-shaped or lobed. Surface moist to dry, smooth to wrinkled. Bright orange to yellow-orange; occasionally ochraceous orange to pinkish orange. **STIPE** 2–9 cm long, 0.1–0.3 cm thick, enlarged towards base, surface moist to lubricous, smooth; base with matted hairs. Translucent white, pinkish white, or pale grayish white. **FLESH** thin, watery, concolorous. **MICROSCOPY:** **Spores** 11–17.5 x 1.5–3 μm , narrowly cylindrical, oblong ellipsoid to clavate, smooth, hyaline, one or two-celled, lacking a gelatinous sheath. **Asci** 115–123 x 5–7.5 μm , elongate-clavate, 8-spored, apical pores amyloid. **Paraphyses** 120–130 x 1.5–3 μm , thread-like, slightly enlarged on upper portions.

ECOLOGY: Saprobic. Scattered or in small clusters on grasses, sedges, pine needles or other small debris in standing water in marshes, bogs and other water-saturated areas. Fruiting in spring and early summer.

SIMILAR SPECIES: *Vibrissea truncorum* grows on woody debris in water (often running streams), but the fruit bodies are smaller, and have rounded heads and short whitish to gray stipes. Fruit bodies of *Heyderia abietis* are smaller, and have ochre-buff heads and brownish stipes; they emerge directly from conifer needles, especially those of true firs (*Abies* spp.) in fall. *Spathularia flavida* is paler, has a flattened paddle-like or fan-like head, and fruits from conifer duff in the fall. *Neolecta vitellina* fruit bodies have brighter yellow, often irregularly shaped heads transitioning gradually into whitish stipes, and they grow in moss or conifer duff in fall or winter.

Pachycudonia monticola

(Mains) S. Imai

COMMON NAME:

SPECIES CODE: CUMO2



FAMILY: placement uncertain (Order: Helotiales)

SYNONYMS: *Cudonia monticola* Mains

SUMMARY: A small fungus with an irregularly rounded to convoluted, cinnamon-pink cap, pinkish brown to purplish gray stipe, and leathery, non-gelatinous flesh. It fruits in spring and summer on conifer duff and woody debris. Rare in California, only known from Sierra and Trinity Counties.

TAXONOMIC NOTES: Also called *Cudonia monticola*; inclusion in *Pachycudonia* has been accepted by most authorities.

DISTRIBUTION: Known from four collections, from two locations in the Sierra Nevada and Klamath Mountains in California and scattered through the Cascades in Oregon and Washington. Also occurring in the Rocky Mountains. **USA:** **CA:** Trinity Co., SRNF, Gray Falls Campground. **Sierra Co.,** TNF, Lincoln Creek Campground. **OR:** 20+ sites. **WA:** 10 sites. **ID:** 10 sites. **MT:** 1 site. **WY:** 1 site. **CO:** 2 sites. **NM:** 1 site. **AZ:** 2 sites. **CANADA:** **BC:** 10 sites. **AB:** 2 sites.

DESCRIPTION: **CAP** 1–3 cm across, convex, irregularly rounded, to compressed and lobed; margin inrolled, but obscure; plump when wet, becoming wrinkled

when dry. Surface dry to moist. Cinnamon-pink, pinkish buff to grayish brown. Underside smooth, concolorous with stipe. **STIPE** 3–7 cm long, 0.4–0.7 cm thick at apex, rounded to ribbed, at times compressed, equal or enlarged downward or slightly bulbous at base. Surface smooth, moist to dry. Light pinkish brown, brown to purplish gray, or purplish brown. **FLESH** fairly tough, leathery in cap, fibrous in stipe. Stipe solid at first, hollow in age. **MICROSCOPY:** **Spores** 20–24 x 2 μm , needle-shaped to very narrowly clavate, single-celled, rarely 1-septate. **Asci** 90–125 x 8–10 μm , clavate, narrowed to pedicel; 2–4 μm across in lower part. **Paraphyses** thread-like, apices strongly curved to hooked.

ECOLOGY: Nutritional mode not known; fruiting in scattered troops or in clusters on conifer duff, moss, or small woody debris in higher elevation forest. Fruiting in spring and early summer, typically from snowmelt moisture.

SIMILAR SPECIES: *Cudonia circinans* is very similar, but more common on the North Coast of California under Sitka Spruce (*Picea sitchensis*). The paler, pinkish buff to beige colors and longer spores, (28–46 x 2 μm) distinguish it. *Leotia lubrica* is typically larger, yellowish to yellow-green colored, and has significantly more rubbery-gelatinous flesh. Microscopically, it has smooth, spindle-shaped 4–6 (8)-septate spores, measuring 16–25 x 4–6 μm . *Spathularia flavida* is pale yellowish in color, and has a flattened paddle-like or fan-shaped head; microscopically, it has, long, thread-like, multi-septate spores (30–75 x 1.5–3 μm). It grows in conifer duff in the fall.

Photo: © Drew Parker.

Pachycudonia spathulata

(S. Imai) S. Imai

COMMON NAME:

SPECIES CODE:



FAMILY: placement uncertain (Order: Helotiales)

SYNONYMS: *Spathularia spathulata* (S. Imai) Mains, *Cudonia spathulata* S. Imai

SUMMARY: A small fungus with an irregularly rounded, convoluted to somewhat spatulate, bright golden yellow to orange 'head,' a pale orange stipe that becomes brownish from the base upwards in age, and leathery, non-gelatinous flesh. Fruiting in winter under manzanita (*Arctostaphylos* spp.). Apparently rare in California; currently known from six voucher-confirmed sites in the state.

TAXONOMIC NOTES: Described by Imai (1942) from Big Basin State Park in Santa Cruz County, California; only five additional collections have been made since in California. This may have to do with the fact it was never published in any field guides and was only known in obscure scientific literature.

DISTRIBUTION: Known from six voucher-confirmed locations in California, in coastal mountains and the Sierra Nevada foothills, and three collections near Gold Hill, in southwest Oregon. Reports from elsewhere appear to be misidentified.

USA: **CA:** Marin Co., SE slope of Mt. Tamalpais. **Sonoma Co.,** Lake Sonoma. **Napa Co.,** Cleary Reserve. **Santa Cruz Co.,** Big Basin State Park (Type). **Yuba**

Co., TNF, Camptonville Road. **Nevada Co.**, Nevada City. Two additional photographs posted on social media appear to be this species, one found in **Sonoma Co.**, the other near Oroville, **Butte Co.** **OR: Jackson Co.**, near Gold Hill.

DESCRIPTION: **CAP** 0.5–3 cm across, irregularly rounded, to compressed and lobed, to somewhat spatulate, plump when wet, becoming wrinkled when dry. Surface dry to moist. Bright golden yellow to orange, fading and sometimes developing reddish tones in age. **STIPE** 1–5 cm long, 0.3–0.7 (1) cm thick equal to irregular, occasionally flattened near apex. Surface smooth, moist to dry. Light orange, yellow-orange to yellowish, developing brownish color from the base up in age. **FLESH** fairly tough, leathery in cap, more fibrous in stipe. Solid at first, stipe hollow in age. **MICROSCOPY:** **Spores** 18–26 x 2 μm , needle-shaped to narrowly clavate, a single cell, or with up to 4 septa. **Asci** 90–110 x 6–8 μm , clavate, narrowed to pedicel; 2–4 μm across in lower part. **Paraphyses** thread-like, apices strongly curved to hooked.

ECOLOGY: Nutritional mode not known. Scattered to gregarious in duff under manzanita (*Arctostaphylos* spp.) and Pacific Madrone (*Arbutus menziesii*) in the Coast Range and Sierra Nevada foothills. Fruiting in winter and early spring.

SIMILAR SPECIES: *Spathularia flavida* is a common species in conifer duff of low to mid-elevation forests in the northern Sierra Nevada and Cascade foothills. It differs by having a pale yellowish or pale yellowish ochre, flattened paddle-like or fan-shaped head, and a more compressed stipe. Microscopically, it has long, thread-like, multi-septate spores (30–75 x 1.5–3 μm). *Pachycudonia monticola* has an irregularly rounded to convoluted, cinnamon-pink cap, and a pinkish brown to purplish gray stipe. It grows in spring and summer on conifer duff and debris in mid- to high-elevations forests. *Cudonia circinans* has a paler, pinkish buff to beige, more rounded or lobed cap, and grows on the North Coast of California, usually under Sitka Spruce (*Picea sitchensis*). It also has longer spores, 28–46 x 2 μm . *Leotia lubrica* is typically larger, has a plump, rounded to convex, yellowish to yellow-green cap, and has rubbery-gelatinous flesh. Microscopically, it has smooth, spindle-shaped 4–6 (8)-septate spores, measuring 16–25 x 4–6 μm .

Photo: © Ted Melvin.

Vibrissea truncorum

(Alb. & Schwein.) Fr.

COMMON NAME: Orange-headed Water Club

SPECIES CODE: VITR14



FAMILY: Vibrisseaceae

SYNONYMS: *Leotia truncorum* Alb. & Schwein.

SUMMARY: The small, brightly colored fruiting bodies with a rounded yellow-orange 'head' on a pallid stipe and growth on saturated or submerged sticks in streams make this species very distinctive. Rare in western North America and especially rare in California; only known from a single location in Eldorado National Forest.

TAXONOMIC NOTES: Western North American collections need to be compared to eastern North American and European collections; there may be two or more geographically distinct taxa.

DISTRIBUTION: Rare in western North America; known from a single California collection in the central Sierra Nevada, with scattered records in the western Cascades, as well as in southeast Alaska. Widespread and occasional in northeastern North America. Also known from Europe. **USA: CA:** El Dorado Co., ENF, tributary to Union Valley Reservoir, west of Ice House Road. **OR:** 3 sites, (2 additional unconfirmed). **WA:** 16 sites (2 additional unconfirmed). **ID:** 2 sites.

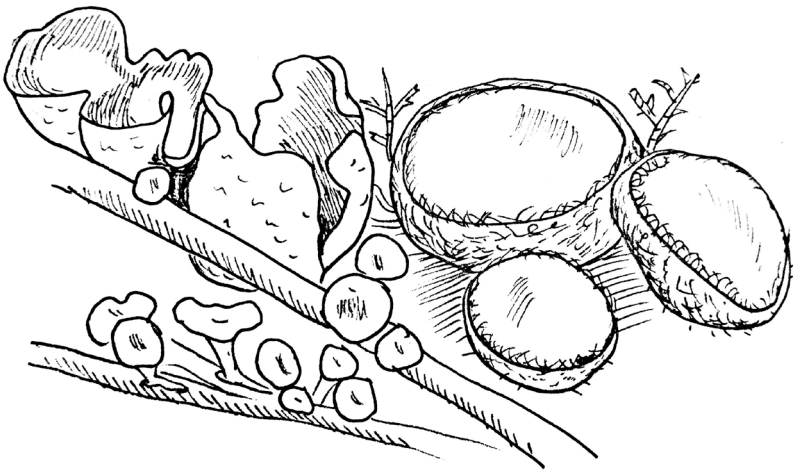
MT: 1 site. **AK:** 1 site, (2 additional unconfirmed). Numerous eastern North American collections. **CANADA: BC:** 11 sites.

DESCRIPTION: **FRUIT BODY** 5–20 mm high overall. **HEAD** 2–5 mm wide, convex to rounded. Bright to pale orange-yellow to orange; rarely reddish orange in age. **STIPE** 4–20 mm long, 1–2 mm thick, whitish to grayish at first, often finely scurfy with dark scales, darkening from the base up, gray to blackish in age. **FLESH** thin, watery, somewhat translucent. **MICROSCOPY:** **Spores** (80) 125–250 x 1 μm , highly variable in length, thread-like, multiseptate. **Asci** 175–325 x 5–6 μm , narrowly clavate. **Paraphyses** straight, simple or branched, thread-like in lower part, enlarged at tips.

ECOLOGY: Saprobic on saturated or submerged twigs, branches, and small logs in creeks, seeps, or other water sources. Fruitings occur scattered or in gregarious troops. Fruit bodies can be found completely underwater or with the heads above water and the substrate submerged. The only California collection came from a creek surrounded by alder (*Alnus* spp.), in montane forest at 1750 m.

SIMILAR SPECIES: A similar species (also rare) that occurs in the same habitat is *Vibrissea filisporia*. It can be distinguished by its paler yellow color, and short or nearly absent stipe. It occurs on submerged twigs and branches of hardwoods. *Mitrulea elegans* is taller, has an oblong to cylindrical, bright orange head, and a thin, proportionally longer, translucent-white stipe. It grows on grass, sedge, and leaf debris in slow-moving water.

CUP FUNGI



Chaetothiersia vernalis

B.A. Perry & Pfister

COMMON NAME:

SPECIES CODE:



FAMILY: Pyronemataceae

SYNONYMS: None

SUMMARY: The irregular cup- or disc-like shape, pale gray to whitish upper surface, tufts of erect hairs on margin, mostly appressed hairs on underside and vernal fruiting on woody debris in high-elevation conifer forests distinguish this fungus. Microscopically, the smooth, ellipsoid spores lacking oil droplets is unique among similar species. Currently confirmed from eight locations from Tuolumne County in the Sierra Nevada, north into the southern Cascades of California, and an unconfirmed report in southern Cascades in Oregon.

TAXONOMIC NOTES: Described by Perry and Pfister (2008) from Yuba Pass, Sierra County, California. We have only recently begun to understand the distribution and habitat preferences of this species. A few other cup fungi are similar, including species in the common genera *Humaria* and *Trichophaea*, but subtle macro-morphological differences and more distinct microscopic differences can be used to separate them.

DISTRIBUTION: Known from eight confirmed locations in high-elevation forest from the central Sierra Nevada north into the Cascades in California. There is a single unconfirmed record from the southern Cascades in Oregon. **USA: CA: Siskiyou Co.,** KNF, near Martin's Dairy. S-TNF, Raccoon Creek, southeast of Grizzly Peak Rd. **Plumas Co.,** Lake Almanor (unconfirmed). **Sierra Co.,** TNF, Highway 49, 3 miles east of Yuba Pass. TNF, Yuba Pass (Type). TNF, Highway 49, "Steele Gulch." **El Dorado Co.,** ENF, Crystal Basin Recreation Area. ENF, near China Flat Campground. **Tuolumne Co.,** StaNF, Pinecrest Lake. **OR: Jackson Co.,** Rogue River–Siskiyou National Forest, Mount McLoughlin, Walters Glade (unconfirmed).

DESCRIPTION: FRUIT BODY: 0.5–3 cm across, deeply to broadly irregularly cup-shaped, with a narrowed base at first, becoming broadly cup- to disc-shaped, often undulating in age. Upper surface pale gray to nearly white, smooth, margin with tufts of erect dark brown hairs. Underside concolorous, densely to sparsely covered with dark to pale brown, appressed or occasionally projecting hairs. **STIPE:** absent. **FLESH** very thin, fragile, whitish to pale gray. **ODOR** indistinct. **TASTE** indistinct. **MICROSCOPY: Spores** 16.5–18.5 × 10–11 (12) μm (17.8 × 10.6 μm on average), ellipsoid, smooth, eguttulate (lacking oil droplets), hyaline. **Paraphyses** exceeding asci by up to 10.5 μm, 1.6–2.4 μm across, narrow, straight, unbranched, multisepate, hyaline.

ECOLOGY: Saprobic; scattered or clustered on decaying logs, stumps, bark and woody debris in soil; typically in Red Fir (*Abies magnifica*) forests. Fruiting in spring, soon after snowmelt.

SIMILAR SPECIES: *Humaria hemisphaerica* looks very similar, but is typically slightly larger, and more evenly cup-shaped. It typically grows from duff, moss or soil, and has larger (20–24 × 10–12 μm), broadly ellipsoid, coarsely warted spores with two conspicuous oil droplets. *Geopora* species are usually partially buried in the ground, are typically larger, and are more rounded-cup shaped. Microscopically, their spores contain one or more oil droplets. *Trichophaea*, *Trichophaeopsis*, and *Tricharina* all resemble *Chaetothiersia vernalis*, but their spores contain oil droplets.

Chloroscypha flavida

(Kanouse & A.H. Sm.) Baral

COMMON NAME:

SPECIES CODE: GEFL5



FAMILY: Helotiaceae

SYNONYMS: *Gelatinodiscus flavidus* Kanouse & A.H. Sm.

SUMMARY: A fungus with small, brightly colored fruit bodies produced on Incense Cedar and Yellow Cedar needles near melting snowbanks in spring and early summer. Recognizable by the habitat, the gelatinous texture, convex to round 'heads' and short to nearly indistinct stipe. Currently known from four locations in the southern Cascades in California, six in Oregon, seven in Washington, and nine in British Columbia, Canada.

TAXONOMIC NOTES: Originally described as *Gelatinodiscus flavidus* by Kanouse & Smith (1940); phylogenetic analysis has shown close affiliation to *Chloroscypha*, and this species was transferred to that genus by Baral (Baral et al. 2013).

DISTRIBUTION: Known from 26 locations from the Mount Shasta area in California, continuing north in the Cascades and Olympic Mountains into British Columbia, Canada. **USA: CA: Siskiyou Co.,** S-TNF, Tate Creek Rd, along Whisky Creek. S-TNF, Moosehead Creek, east of 39N93. S-TNF, Bartle Creek, 0.5 mile west of FR 15, 2 miles north of FR 49. S-TNF, Raccoon Creek, southeast of Grizzly Peak

Rd. **OR:** 6 sites. **WA:** 7 sites. **CANADA:** **BC:** 9 sites.

DESCRIPTION: **FRUIT BODY:** Top-shaped, with short stipe and rounded head 1–5 mm across, concave when young, soon plane to convex, glabrous. Upper surface bright yellow to golden yellow, underside concolorous. Flesh thin, gelatinous. **STIPE:** 1–5 mm long, 1 mm thick, glabrous, or with faint tomentum at base. **MICROSCOPY:** **Spores** 26–34 x 9–11 μm , ellipsoid to oblong-ellipsoid, with one end slightly broader than other, smooth, hyaline to pale yellow, with two oil droplets. **Asci** 8-spored, amyloid at tips. **Paraphyses** curved near top branched, hyaline.

ECOLOGY: Saprobic; growing on Incense Cedar (*Calocedrus decurrens*) and Yellow Cedar (*Cupressus nootkatensis*) foliage near melting snowbanks in spring and early summer.

SIMILAR SPECIES: The more common *Chloroscypha alutipes* also grows on *Calocedrus decurrens* foliage, but forms tiny, yellow to brownish, cup-like fruit bodies, lacks the gelatinous flesh and has smaller, spindle-shaped spores, 18–20 x 5–8 μm . *Gymnosporangium libocedri* forms irregular gelatinous discs or ‘blobs’ on fresher (green) Incense Cedar foliage. *Dacrymyces* and *Heterotextus* species are often larger, grow on twigs and branches, and differ microscopically.

Otidea smithii

Kanouse

COMMON NAME: Purple-brown Rabbit Ear

SPECIES CODE: OTSM



FAMILY: Pyronemataceae

SYNONYMS: None

SUMMARY: A medium-sized to large cup fungus distinguished by its somewhat lopsided, often irregularly rabbit-ear shape, dark purple-brown colors, often clustered growth habit, and microscopically by inamyloid asci. Although uncommon, it occurs with introduced trees in urban areas, suggesting that it is a habitat generalist. Most of the range of this species is not on California's National Forest land. Listed as a Forest Service sensitive species on some Region 5 forests.

TAXONOMIC NOTES: Described by Kanouse (1939), from near Lake Earl, Del Norte County, California.

DISTRIBUTION: Known from six locations on the California coast, occurring north into Canada; also known from the Rocky Mountains. Potentially, this species could be found in the foothills around the Central Valley. A reported collection from TNF, in Yuba County, California was misidentified. **USA: CA: Del Norte Co.,** Tolowa Dunes State Park, near Lake Earl (Type). **Humboldt Co.,** Samoa dunes. **Mendocino Co.,** Jackson State Forest. **Sonoma Co.,** Salt Point State Park. **Alameda**

Co., Berkeley, near the UC-Berkeley campus. **Santa Cruz Co.**, Quail Hollow Ranch County Park. **OR:** 5 sites. **WA:** 5 sites. **ID:** 6 sites. **CO:** 1 site. **MT:** 1 site. **CANADA:** **BC:** 6 sites. **AB:** 1 site. **YT:** 1 site.

DESCRIPTION: **FRUIT BODY:** 3–11 cm across, 5–11 cm tall, variably shaped, often a lopsided cup, shorter and slit or folded on one side (rabbit ear shape), often irregularly folded and wavy. Margin folded in when young, flaring in age. Upper surface smooth to wrinkled, bare. Upper surface dark purplish brown to vinaceous brown, fading slightly purplish brown to slightly more orange-brown. Underside concolorous, often with distinct bands of wrinkles, slightly paler than fertile surface. **STIPE:** 1–2 cm long, 0.5–1 cm thick, stout, pinched. Pale whitish, dingy cream to light tan. **FLESH** thin, rubbery to somewhat fragile. **ODOR** indistinct. **TASTE** indistinct. **MICROSCOPY:** **Spores** 12–14 (14.5) x 6–7.5 μm , narrowly ellipsoid, smooth, with two oil droplets. **Asci** 100–160 x 12–14 μm , 8-spored, in-amyloid. **Paraphyses** with large hooked or bent tips, sometimes ornamented with small irregular projections.

ECOLOGY: Nutritional mode not known, possibly ectomycorrhizal. Scattered, often clustered, in humus or moss, occasionally in grassy areas. Typically found under conifers and Bigleaf Maple (*Acer macrophyllum*) in the northern part of its range, and under live oaks (*Quercus* spp.) to the south; also occurs with introduced *Cedrus*. Fruiting in fall and winter, occasionally in summer in irrigated areas.

SIMILAR SPECIES: *Otidea leporina* has paler brown to buff-brown colors, and slightly wider spores (12.5–14 x 7–8.5 μm). *Otidea alutacea* is smaller, paler yellowish brown to reddish brown, with a typically solitary to gregarious (rarely clustered) growth habit and longer spores 14.5–16.5 (17.5) x 6.5–7.5 μm . *Wynnella silvicola* is very similar in color (dark red-brown to dark brown), but typically has more narrow/upright rabbit ear-shaped fruit bodies and larger, broadly ellipsoid spores, (17–24 x 11.5–17 μm), with a single droplet, as well as clavate paraphyses. *Peziza* species have less-upright, bowl- or cup-shaped fruit bodies and distinctly amyloid ascus tips.

Pachyella babingtonii

(Berk. & Broome) Boud.

COMMON NAME:

SPECIES CODE:



FAMILY: Pezizaceae

SYNONYMS: *Rhizina babingtonii* (Berk. & Broome) Masee & Crossl., *Peziza babingtonii* Berk. & Broome, *Psilopezia babingtonii* (Berk. & Broome) Berk., *Chaetothyrum babingtonii* (Berk. & Broome) Keissl., *Adelphella babingtonii* (Berk. & Broome) Pfister, Matočec & I. Kušan

SUMMARY: The small size, reddish brown color, cushion-shaped fruit bodies (plump when wet, becoming depressed when dry) and growth on saturated branches, twigs and herbaceous stems in wet areas help distinguish this species. In California, it is currently only known from two closely spaced locations in Sierra County, and a single site on the North Coast in Marin County. However, this is a very inconspicuous fungus and it may be underreported.

TAXONOMIC NOTES: Pfister et al. (2009) coined *Adelphella* to accommodate *Pachyella babingtonii*; consensus may eventually accept this transfer. Western collections should be compared to eastern North American collections, as they may be distinct taxa.

DISTRIBUTION: Known from three collections in California, two in Sierra County,

in the northern Sierra Nevada, and a single site on the coast. Also known from two sites in Oregon, one in Washington, and several in the Rocky Mountains. It is widespread and common across eastern North America and Europe. **USA: CA: Sierra Co.**, TNF, Green Acres Road. TNF, north of Gold Lake. **Marin Co.**, Audubon Canyon Ranch. **OR: Hood River Co.**, Dee. **Benton Co.**, Mary's Peak. **WA: Pierce Co.**, Mount Rainier National Park, Lower Tahoma Creek.

DESCRIPTION: **FRUIT BODY** 2–10 mm across, cushion-shaped, convex to rounded when wet, becoming depressed and wrinkled upon drying, to disc-like when dry. Pale ochre to reddish brown, or vinaceous brown. **STIPE** absent. **FLESH** thin, translucent, gelatinous. **MICROSCOPY: Spores** 17–23 x 9–16 μm , broadly ellipsoid, smooth, hyaline, with 2 (sometimes 1) oil droplets. **Asci** 250–325 x 15–20 μm , 8-spored, weakly amyloid. **Paraphyses** extending beyond the asci, clavate, expanded at tip to 7–15 μm ; tips pigmented with small, dark, highly cyanophilic granules.

ECOLOGY: Saprobic; scattered on saturated logs, branches or coarse plant debris. One of the California collections from the Sierra Nevada was on dead California Corn Lily (*Veratrum californicum*) stems in standing water. Fruiting in spring and early summer.

SIMILAR SPECIES: *Ascocoryne* species are similar, but typically more purple-colored, grow in fused masses of cushion-, top- or cup-shaped fruit bodies and have narrowly ellipsoid spores; they grow on wood (often *Alnus* or *Salix*), but never in water. *Smardaea planchonis* is similar in shape, but is more deeply purple, and grows on mosses rather than directly on herbaceous vegetation or saturated wood.

Sclerotinia sulcata

(Roberge ex Desm.) Whetzel

COMMON NAME:

SPECIES CODE:



FAMILY: Sclerotiniaceae

SYNONYMS: *Myriosclerotinia sulcata* (Roberge ex Desm.) N.F. Buchw., *Sclerotium sulcatum* Roberge ex Desm.

SUMMARY: A small cup fungus with a slender stalk that emerges from a sclerotium embedded in dead sedge culms in standing water or areas of saturated soil. Rare in western North America; in California, only known from four locations.

TAXONOMIC NOTES: DNA sequences from western North American specimens need to be compared with sequences from eastern North American and European specimens; there may be two or more distinct taxa under this name.

DISTRIBUTION: Widespread but apparently rare in North America. Identity of Alaskan collections needs to be confirmed. Known from California and scattered locations in northeastern North America and Europe. **USA: CA: Siskiyou Co.,** S-TNF, Trout Creek. MoNF, Payne Spring. **Plumas Co.,** PNF, Woodsy Fen. **Sierra Co.,** TNF, near Yuba Pass.

DESCRIPTION: CUP 0.5–1.2 cm across, cup- to bowl-shaped, spreading slightly in age; surface smooth to wrinkled. Amber-brown to light brown. **STIPE** 0.5–4 cm

tall, 1–3 mm thick, equal or tapering towards base. Apex amber-brown to light brown transitioning to dark brown to blackish at base. **SCLEROTIUM** black, irregularly elongate, cylindrical to ovoid, 0.2–3 cm long, 0.1–0.4 cm thick. **FLESH** very thin, fragile in cup portion; stipe somewhat cartilaginous-wiry. **MICROSCOPY:** **Spores** 12–15 x 5.5–6.5 μm , ovoid to inequilateral, smooth, hyaline, without oil droplets. **Asci** 150–160 x 9–10 μm , 8-spored. **Paraphyses** narrow, thread-like; tips slightly enlarged; base forked.

ECOLOGY: Scattered to gregarious on submerged culms of the previous year's growth of sedges (*Carex* spp.), arising from a black sclerotium that developed within the *Carex* culm. Growing in marshes, or saturated areas with standing water and sedge hummocks. The sclerotium starts forming in late summer and fall, whereas the fruit body is produced in spring when the sclerotium is submerged by water from snowmelt.

SIMILAR SPECIES: The common *Sclerotinia veratri* is very similar; it has a cup-shaped fruit body when young that becomes more disc-shaped in age, typically has a shorter stipe and an irregular sclerotium, and grows on dead stems of California Corn Lily (*Veratrum californicum*). *Sclerotinia sclerotiorum* is typically smaller and grows from the stems of herbaceous plants. *Ciboria rufofusca* also has a cup- to disc-shaped cap and a distinct (but often fairly short) stipe; it grows from conifer cones (especially Douglas-fir, *Pseudotsuga menziesii*) or cone scales of true firs (*Abies* spp.). An unidentified (possibly undescribed) cup fungus that looks like a miniature version of *S. sulcata* is quite common on the dead culms of grasses and sedges in the same wet, often submerged habitat. Besides being smaller, it has a flatter, broader cup, and lacks the sclerotium.

Vibrissea filisporia

(Bonord.) Korf & A. Sánchez

COMMON NAME:

SPECIES CODE:



FAMILY: Vibrisseaceae

SYNONYMS: *Sarea filisporia* Bonord.

SUMMARY: *Vibrissea filisporia* has small, top-shaped fruit bodies, with a yellowish top, yellowish to brownish, often scurfy underside, and a short to indistinct stipe. It grows on submerged sticks and woody debris in streams. Widespread, but rare. The most recent herbarium collections of this species from North America reported on MyCoPortal were made in 1964. No collections exist from California. What is believed to be *Vibrissea filisporia* was photographed in 2015, in PNF, and close by in LNF in 2016, but no collections were made. It was reported from Oregon on French Creek in the Breitenbush River drainage; little information is available regarding these localities.

TAXONOMIC NOTES: DNA sequences from western North American specimens need to be compared with those from eastern North American and European specimens, as they may belong to a distinct taxon. Californian and western North American collections are most likely *Vibrissea filisporia* f. *boudieri* A. Sánchez & Korf, which has paraphyses that are repeatedly branched, ending in terminal clusters of three or more, and spores 210–315 μm long. However, this character-

ization is based on a single collection, and more research is needed.

DISTRIBUTION: Widespread, but apparently rare; occurring in Europe and North America. Known from two (unconfirmed) locations in California, and one in central Oregon. There is a historic record (1892) from Washington. **USA: CA: Lassen Co.,** LNF, northeast of Diamond Mt. (per N. Siegel, photograph only). **Plumas Co.,** PNF, spring on north side of Kettle Rock (per N. Siegel, photograph only). **OR: Marion Co.,** Willamette National Forest, French Creek, Breitenbush River drainage. **WA: King Co.,** Location unknown. **NY:** 1 site. **CT:** 2 sites.

DESCRIPTION: FRUIT BODY 1–8 mm across, 1–5 mm tall, top-shaped to convex, yellowish to pale orange-ochraceous, or grayish yellow. Underside yellow to brownish, often furfuraceous. **FLESH** thin, gelatinous. **STIPE** indistinct to short and broad. **MICROSCOPY: Spores** 200–315 x 1 μm , thread-like, multiseptate, parallel in ascus. **Asci** 165–325 x 5–6 μm ; apex rounded. *Forma gigantospora* from Washington, has spores 440–465 x 1–2 μm , and asci 470–490 x 8–10 μm . **Paraphyses** numerous, longer than asci, thread-like, hyaline, repeatedly forked or multi branched at projecting tips.

ECOLOGY: Saprobic on woody debris. Scattered to gregarious on twigs and branches, often submerged in water in running creeks. The California reports were from Alder (*Alnus* spp.) branches in small, year-round creeks below springs. Fruit bodies can be found completely underwater or on saturated branches in splash zones.

SIMILAR SPECIES: *Vibrissea truncorum* occurs in the same habitat, but has brightly colored, rounded heads, and a distinct whitish to gray stipe. *Dacrymyces stillatus* (and other similar *Dacrymyces* species) have distinctly gelatinous flesh and are basidiomycetes (thus lacking asci). They have ellipsoid spores, long tuning-fork basidia and typically don't grow underwater (but may be found on very damp wood near running water).

References and Other Resources

Albee-Scott, S. 2007. The position of the Leucogastrales, including *Mycolevis sicigleba* (Cribbeaceae) in the Albatrellaceae using morphological and molecular data. *Mycological Research* 111: 653–662.

Albertini, J.B. & L.D. von Schweinitz. 1805. *Conspectus Fungorum in Lusatae superioris* 376 pp.

Ammirati, J.F. 1989. *Dermocybe*, subgenus *Dermocybe*, section *Sanguineae* in northern California. *Mycotaxon* 34: 21–36.

Ammirati, J.F., T. Niskanen, K. Liimatainen, D. Bojantchev, U. Peintner, R. Kuhner-Finkernagel & C. Cripps. 2017. Spring and early summer species of *Cortinarius*, subgenus *Telamonia*, section *Colymbadini* and *Flavobasilis*, in the mountains of western North America. *Mycologia* 109: 443–458.

Arora, D. 1986. *Mushrooms Demystified*, 2nd Edition. Ten Speed Press, Berkeley, CA. 959 pp.

Atkinson, G.F. 1908. A new poisonous mushroom. *Botanical Gazette*. 46: 461–463.

Baral, H.O., R. Galán, G. Platas & R. Tena. 2013. *Phaeohelotium undulatum* comb. nov. and *P. succineoguttulatum* sp. nov., two segregates of the *Discinella terrestris* aggregate found under *Eucalyptus* in Spain: taxonomy, molecular biology, ecology and distribution. *Mycosystema* 32: 386–428.

Bazzicalupo, A.L., B. Buyck, I. Saar, J. Vauras, D. Carmean & M.L. Berbee. 2017. Troubles with mycorrhizal mushroom identification where morphological differentiation lags behind barcode sequence divergence. *Taxon* 66: 791–810.

Bessette, A.E., A.R. Bessette, W.C. Roody & S.A. Trudell. 2013. *Tricholomas of North America—A Mushroom Field Guide*. University of Texas Press, Austin. 208 pp.

Bessette, A.E., W.C. Roody & A.R. Bessette. 2000. *North American Boletes—A Color Guide to the Fleshy Pored Mushrooms*. Syracuse University Press, Syracuse. 400 pp.

Beug, M., A.E. Bessette & A.R. Bessette. 2014. *Ascomycete Fungi of North America—A Mushroom Reference Guide*. University of Texas Press, Austin. 488 pp.

Bigelow, H.E. 1973. *Cantharocybe*, a new genus of Agaricales. *Mycologia* 65: 485–488.

Bigelow, H.E. 1975. Studies in the *Tricholomataceae*: *Hygrophoropsis*, *Cantharellula*, *Myxomphalia*, *Omphaliaster*. *Beihefte zur Nova Hedwigia* 51: 61–78.

Boekhout, T. 1990. *Volvariella*. In: C. Bas, Th.W. Kuyper, M.E. Noordeloos & E.C. Vellinga (eds). *Flora agaricina neerlandica* 2: 56–64. A.A. Balkema, Rotterdam/

Brookfield.

Bojantchev D. 2017. Mushroom Hobby. Available at www.mushroomhobby.com. Date access: February–June 2017.

Bojantchev, D. 2013. *Cortinarius* of California: Seven new species in subg. *Telamonia*. Mycotaxon. 123: 375–402.

Bonito, G., J.M. Trappe, P. Rawlinson & R. Vilgalys. 2010. Improved resolution of major clades within *Tuber* and taxonomy of species within the *Tuber gibbosum* complex. Mycologia 102: 1042–1057.

Bonorden, H.F. 1853. Beiträge zur Mykologie. Botanische Zeitung 11: 281–296.

Brandrud, T.-E. 2015. *Tricholoma apium*. The IUCN Red List of Threatened Species <http://dx.doi.org/10.2305/IUCN.UK.2015-4.RLTS.T79515478A79515482.en>.

Brazee, N.J. & D.L. Lindner, 2013. Unravelling the *Phellinus pini* s.l. complex in North America: a multilocus phylogeny and differentiation analysis of *Porodadalea*. Forest Pathology 43: 132–143.

Breitenbach, J. & F. Kränzlin. 1984. *Fungi of Switzerland Volume 1: Ascomycetes*. Edition Mykologia Lucerne. 310 pp.

Bridge, P.D., B.M. Spooner, R.E. Beever & D.-C. Park. 2008. Taxonomy of the fungus commonly known as *Stropharia aurantiaca* with new combinations in *Leratiomyces*. Mycotaxon 103: 109–121.

Brunner, I.L. & O.K. Miller Jr. 1988. *Calocybe fallax*: its ecology and cultural behavior. Mycotaxon 33: 41–50.

Burdsall, Jr., H.H., T.J. Volk & J.F. Ammirati. 1996. *Bridgeoporus*, a new genus to accommodate *Oxyporus nobilissimus* (Basidiomycotina, Polyporaceae). Mycotaxon 60: 387–395.

Castellano, M. 1990. The new genus *Trappea* (Basidiomycotina, Hysterangiaceae), a segregate from *Hysterangium*. Mycotaxon 38: 1–9.

Castellano, M. 1995. NATS truffle and truffle-like fungi. 4: *Amogaster viridigleba* gen. et sp. nova, a new truffle-like fungus from the Sierra Nevada. Mycotaxon 55: 185–188.

Castellano, M. 2015. *Destuntzia rubra*. The IUCN Red List of Threatened Species 2015: e.T75102369A75721162. <http://dx.doi.org/10.2305/IUCN.UK.2015-4.RLTS.T75102369A75721162.en>.

Castellano, M. 2015. *Fevansia aurantiaca*. The IUCN Red List of Threatened Species 2015: <http://dx.doi.org/10.2305/IUCN.UK.2015-4.RLTST757231-77A75723220.en>.

Castellano, M., E. Cázares, B. Fondrick & T. Dreisbach. 2003. *Handbook to Additional Fungal Species of Special Concern in the Northwest Forest Plan*. General Technical Report PNW-GTR-572. United States Department of Agriculture. Forest Service, Pacific Northwest Research Station. 144 pp.

Castellano, M., J.E. Smith, T. O'Dell, E. Cázares & S. Nugent. 1999. *Handbook to Strategy 1 Fungal Species in the Northwest Forest Plan*. General Technical Report PNW-GTR-476. United States Department of Agriculture. Forest Service, Pacific Northwest Research Station. 195 pp.

Cázares, E. & J.M. Trappe. 1991. Alpine and subalpine fungi of the Cascade and Olympic Mountains. 3. *Gastroboletus ruber* comb. nov. *Mycotaxon* 42: 339–345.

Chapela, I H. & M. Garbelotto. 2004. Phylogeography and evolution in matsutake and close allies inferred by analyses of ITS sequences and AFLPs. *Mycologia* 96: 730–741.

Chen, J.J., B.K Cui, S.H. He, J.A. Cooper, M.A. Barrett, J.L. Chen, & Y.C. Dai. 2016. Molecular phylogeny and global diversity of the remarkable genus *Bondarzewia* (Basidiomycota, Russulales). *Mycologia* 108: 697–708.

Christensen, M. & J. Heilmann-Clausen. 2013. *The genus Tricholoma. Fungi of Northern Europe, vol. 4.* Svampetryk. Denmark. 228 pp.

Cooke, M.C. & J.B. Ellis. 1878. New Jersey fungi. *Grevillea* 7: 4–10.

Cooke, W.B. 1949. *Oxyporus nobilissimus* and the genus *Oxyporus* in North America. *Mycologia* 41: 442–455.

Cooke, W.B. 1955. Subalpine fungi and snowbanks. *Ecology* 36: 124–130.

Cripps, C.L., V. Evenson & M. Kuo. 2016. *The essential guide to Rocky Mountain mushrooms by habitat*. University of Illinois Press. 262 pp.

De Kesel, A., 2001. A mushroom dryer for the travelling mycologist. *Field Mycology* 2: 131–133.

Desjardin, D. E. 1987. *The Agaricales (Gilled Fungi) of California* 7. *Tricholomataceae I. Marasmioid Fungi: The Genera Baeospora, Crinipellis, Marasmiellus, Marasmius, Micromphale, and Strobilurus*. Mad River Press, Eureka, CA.

- Desjardin, D.E. 1987.** New and noteworthy marasmioid fungi from California. *Mycologia* 79: 123–134.
- Desjardin, D.E. 2003.** A unique ballistosporic hypogeous sequestrate *Lactarius* from California. *Mycologia* 95: 148–155.
- Desjardin, D.E. & S.A. Redhead. 1987.** California Collybias. I. *Collybia bakerensis*, a common snowbank agaric. *Mycotaxon* 29: 321–327.
- Desjardin, D.E., M.G. Wood & F.A. Stevens. 2015.** *California Mushrooms: The Comprehensive Identification Guide*. Timber Press, Portland, OR. 560 pp.
- Desmazières, J.B.H.J. 1851.** Dix-neuvième notice sur les plantes cryptogames récemment découvertes en France. *Annales des Sciences Naturelles Botanique* 16: 296–330.
- Domínguez de Toledo, L.S., Castellano, M.A. 1996.** A revision of the genera *Radiigera* and *Pyrenogaster*. *Mycologia* 88: 863–884.
- Dreisbach T.A., 1997.** The *Phellinus pini* complex: genetic and population studies within and between species. PhD Dissertation, Oregon State University, Corvallis. 157 pp.
- Egli, S., M. Peter, C. Buser, W. Stahel & F. Ayer. 2006.** Mushroom picking does not impair future harvests—results of a long-term study in Switzerland. *Biological Conservation* 129: 271–276.
- Elliott, T.F. & J.M. Trappe. 2018.** A worldwide nomenclature revision of sequestrate *Russula* species. *Fungal Systematics and Evolution* 1: 229–242.
- Estrada-Torres, A., T.W. Gaither, D. L. Miller, C. Lado, & H.W. Keller. 2005.** The myxomycete genus *Schenella*: morphological and DNA sequence evidence for synonymy with the gasteromycete genus *Pyrenogaster*. *Mycologia* 97: 139–149.
- Exeter, R., L.L. Norvell & E. Cázares. 2006.** *Ramaria of the Pacific Northwestern United States*. USDI BLM/OR/WA/PT-06/050-1792, Salem, OR. 157 pp.
- Fogel, R. 1975.** The genus *Leucogaster* (Basidiomycetes, Leucogastraceae). PhD Dissertation, Oregon State University, Corvallis.
- Fogel, R. 1976.** Notes on distribution and spore ornamentation of *Mycolevis sicigleba* (Basidiomycetes, Cribbeaceae). *Mycologia* 68: 1097–1103.
- Fogel, R. 1994.** Materials for a hypogeous mycoflora of the Great Basin and adjacent cordilleras of the Western United States II. Two subemergent species

Cortinarius saxamontanus sp. nov., and *C. magnivelatus*, plus comments on their evolution. *Mycologia* 86: 795–801.

Fogel, R. & J.M. Trappe. 1976. Additions to the hypogeous mycoflora of Colorado. I. Ascomycetes. *Mycotaxon* 4: 211–217.

Fogel, R. & J.M. Trappe. 1985. *Destuntzia*, a new genus in the Hymenogastraceae (Basidiomycotina). *Mycologia* 77: 732–742.

Frank, J. L. 2014. Nomenclatural novelties. *Index Fungorum* 179. <http://www.indexfungorum.org/Publications/Index%20Fungorum%20no.179.pdf>

Frank, J.L. 2015. Nomenclatural novelties. *Index Fungorum* 248. <http://www.indexfungorum.org/Publications/Index%20Fungorum%20no.248.pdf>

Frank, J.L. 2015. The fungal life aquatic: Freshwater observations. *FUNGI* 8 32–35.

Frank, J.L., N. Siegel, & C.F. Schwarz. 2019. *Xerocomellus* in western North America. Draft manuscript.

Fries, E.M. 1818. *Observationes mycologicae* 2. 372 pp.

Fries, E.M. 1822. *Systema Mycologicum* 2. 275 pp.

Fries, E.M. 1838. *Epicrisis Systematis Mycologici*. 610 pp.

Fries, E.M. 1861. Hymenomycetes novi vel minus cogniti, in Suecia 1852–1860 observati. *Öfvers. K. VetenskAkad. Förh* 18: 19–34.

Funk, V.A., R. Edwards & S. Keeley. 2018. The problem with(out) vouchers. *Taxon* 67: 3–5.

Ge, Z.W. & M.E. Smith. 2013. Phylogenetic analysis of rDNA sequences indicates that the sequestrate *Amogaster viridiglebus* is derived from within the agaricoid genus *Lepiota* (Agaricaceae). *Mycological Progress* 12: 151–155.

Giachini A. 2004. *Systematics, Phylogeny, and Ecology of Gomphus sensu lato*. Ph.D. Dissertation. Oregon State University: Corvallis, OR. 446 pp.

Giachini, A.J. & M.A. Castellano. 2011. A new taxonomic classification for species in *Gomphus sensu lato*. *Mycotaxon* 115: 183–201.

Gilbertson, R. L. & L. Ryvarden. 1986. *North American Polypores. Volume 1: Abortiporus—Lindtneria*. Fungiflora. Oslo, Norway. 433 pp.

Gilbertson, R.L. & L. Ryvarden. 1987. *North American Polypores. Volume 2: Megaspore-*

roporia—*Wrightoporia*. Fungiflora. Oslo, Norway. 452 pp.

Gilkey, H.M. 1916. *A revision of the Tuberales of California*. University of California Publications in Botany 6: 275–356.

Gilkey, H.M. 1925. Five new hypogeous fungi. *Mycologia* 17: 250–254.

Gilkey, H.M. 1954. Tuberales. North American Flora. Series II, Part 1.1–36.

Ginns, J. 2017. *Polypores of British Columbia (Fungi: Basidiomycota)*. Prov. B.C., Victoria, B.C. Tech. Rep. 104. www.for.gov.bc.ca/hfd/pubs/Docs/Tr/TR104.htm.

Gordon M. & C. Apple. 2011. Field monitoring the seasonal variation in *Albatrellus ellisii* mycelium abundance with a species-specific genetic marker. *Mycologia* 103: 950–958.

Gordon, M. & K. van Norman. 2015. Abundance of *Bridgeoporus nobilissimus*. North American Fungi 10: 1–28.

Hall D.S. 1991. Diet of the northern flying squirrel at Sagehen Creek, California. *Journal of Mammology* 72: 615–617.

Halling R. http://sweetgum.nybg.org/science/projects/boletineae/wp-content/uploads/sites/6/2016/08/collecting_illustrated.pdf. Date access: February–June 2017

Han, M.L., Y.Y. Chen, L.L. Shen, J. Song, J. Vlasák, Y.C. Dai & B.K. Cui. 2016. Taxonomy and phylogeny of the brown-rot fungi: *Fomitopsis* and its related genera. *Fungal Diversity* 80: 343–373.

Harkness, H.W. 1899. Californian hypogaeous fungi. *Proceedings of the California Academy of Sciences* 1: 241–291.

Hesler, L.R. & A.H. Smith. 1963. *North American Species of Hygrophorus*. University of Tennessee Press, Knoxville. 416 pp.

Hoover, L.D., T.E. Carlberg, E. Rentz & C. Schreiber. 2015. Draft Survey and Manage Category B Fungi Strategic Survey Report. USDA Forest Service, Pacific Southwest Region Northwest Forest Plan Area. United States Forest Service Draft Report.

Hosen, M.I., T.H. Li, D.J. Lodge & A. Rockefeller. 2016. The first ITS phylogeny of the genus *Cantharocybe* (Agaricales, Hygrophoraceae) with a new record of *C. virosa* from Bangladesh. *Mycologia* 14: 37–50.

Hughes, K.W., R.H. Petersen, J.E. Johnson, J.M. Moncalvo, R. Vilgalys, S.A. Redhead,

T.Thomas & L.L. McGhee. 2001. Infragenic phylogeny of *Collybia* s. str. based on sequences of ribosomal ITS and LSU regions. *Mycological Research* 105: 164–172.

Hyde, K.D., C. Norphanphoun, V.P. Abreu, A. Bazzicalupo, et al. 2017. Fungal diversity notes 603–708: taxonomic and phylogenetic notes on genera and species. *Fungal Diversity* 87: 1–235.

Imai, S. 1942. Contributiones ad studia monographica Geoglossacearum. *Botanical Magazine Tokyo* 56: 523–527.

Index Fungorum. 2019. <http://www.indexfungorum.org>.

Jarvis, S.S. 2014. *The Lycoperdaceae of California*. Master's thesis, San Francisco State University. 335 pp.

Kanouse, B.B. & A.H. Smith. 1940. Two new genera of Discomycetes from the Olympic National Forest. *Mycologia* 32: 756–759.

Kanouse, B.B. 1939. Notes on new or unusual Discomycetes. *Papers of the Michigan Academy of Sciences* 24: 25–29.

Keissler, K. von. 1924. Schedae ad “Kryptogamas exsiccatas” editae a Museo historiae naturalis Vindobonensi (olim Museum Palatinum). *Annalen des Naturhistorischen Museums Wien* 37: 201–216.

Kirk, P.M. 2015. Index Fungorum no. 278. <http://www.indexfungorum.org/Publications/Index%20Fungorum%20no.278.pdf>

Knapp J.L. 1829. *The Journal of a Naturalist*. London, UK: J. Murray.

Kreisel, H. 1967. Taxonomisch–Pflanzengeographische monographie der Gattung *Bovista*. *Beihefte zur Nova Hedwigia* 25: 1–244.

Kretzer, A. & T.D. Bruns. 1997. Molecular revisitation of the genus *Gastrospillum*. *Mycologia* 89: 586–589.

Kuo, M. 2009. *Lactarius rubriviridis*. Retrieved from MushroomExpert.Com Web site: http://www.mushroomexpert.com/lactarius_rubriviridis.html. Date access: April 30th, 2017.

Kytövuori, I. 1988. The *Tricholoma caligatum* group in Europe and North Africa. *Karstenia* 28: 65–77.

Kim, K.M., Y. G. Yoon, & H.S. Jung. 2005. Evaluation of the monophyly of *Fomitopsis* using parsimony and MCMC methods. *Mycologia* 97: 812–822.

Largent, D.L. 1985. New taxa of *Hygrophorus* from California. *Mycotaxon*. 23: 383–404.

Largent, D.L. 1994. *The Agaricales (Gilled Fungi) of California 5. Hygrophoraceae*. Mad River Press, Eureka, CA. 208 pp.

Largent, D.L. 1995. *Entolomatoid Fungi of the Western United States and Alaska*. Mad River Press, Eureka, CA. 516 pp.

Larsen, M.J. & L.A. Cobb-Pouille. 1990. The genus *Phellinus* (Hymenochaetaceae): A survey of the world taxa. *Synopsis Fungorum* vol. 3. Fungiflora, Oslo, Norway.

Larsen, M.J., F.F. Lombard & P.E. Aho. 1979. A new variety of *Phellinus pini* associated with cankers and decay in white firs in southwestern Oregon and northern California. *Canadian Journal of Forest Research* 9: 31–38.

Lebo, D. 2007. Species Fact Sheet: *Bridgeoporus nobilissimus*. <http://www.fs.fed.us/r6/sfpnw/issssp/documents/planning-docs/sfs-fu-bridgeoporus-nobilissimus-2007-07-02.doc>. Access date: April 25th, 2017.

Lennox, J.W. 1979. Collybioid genera in the Pacific Northwest. *Mycotaxon* 9: 117–231.

Li, Y.C., Z.L. Yang & B. Tolger. 2009. Phylogenetic and biogeographic relationships of *Chroogomphus* species as inferred from molecular and morphological data. *Fungal Diversity* 38: 85–104.

Liimatainen, K., T. Niskanen, B. Dima, I. Kytövuori, J.F. Ammirati & T.G. Frøslev. 2014. The largest type study of Agaricales species to date: bringing identification and nomenclature of *Phlegmacium* (*Cortinarius*) into the DNA era. *Persoonia* 33: 98–140.

Lindner, D.L., H.H. Burdsall & G.R. Stanosz. 2006. Species diversity of polyporoid and corticioid fungi in northern hardwood forests with differing management histories. *Mycologia* 98: 195–217.

Lundell, S. & J.A. Nannfeldt. 1934. *Fungi Exsiccati Suecici*. Fasc. 2. 100 pp.

Maas Geesteranus, R.A. 1992. I: *Studies in Mycenas and other papers*. North Holland, Amsterdam. 391 pp.

Maas Geesteranus, R.A. 1992. II: *Conspectus of the Mycenas of the Northern Hemisphere*. North Holland, Amsterdam. 493 pp.

- Macbride, T.H. 1911.** A new genus of Myxomycetes. *Mycologia* 3: 39–40.
- Mahalovich, M. & L. Stritch. 2013.** *Pinus albicaulis*. The IUCN Red List of Threatened Species. 2013. e.T39049A2885918.1.RLTS.T39049A2885918.en.
- Mains, E.B. 1940.** New and unusual species of the Geoglossaceae. *American Journal of Botany* 27: 322–326.
- Mains, E.B. 1955.** North American hyaline-spored species of Geoglossaceae. *Mycologia* 47: 846–877.
- Malençon, G. & L. Rioussel. 1977.** *Pyrenogaster pithyopilus* G. Malençon et L. Rioussel, nouveau genre et nouvelle espèce de Gastéromycète (Gastraceae). *Bulletin de la Société Mycologique de France* 93: 289–311.
- Marr, C.D. & D. E. Stuntz. 1973.** *Ramaria* in western Washington. *Bibliotheca Mycologica* 38: 1–232.
- Matheny, P.B., J.M. Curtis, V. Hofstetter, et al. 2006.** Major clades of Agaricales: a multilocus phylogenetic overview. *Mycologia* 98: 982–95.
- Miller, O.K. 1984.** A New Species of *Hygrophorus* from North America. *Mycologia* 76: 816–819.
- Miller, O.K. 2003.** The Gomphidiaceae revisited: a worldwide perspective. *Mycologia* 95: 176–183.
- Miller, O.K., M.C. Aime, F.J. Camacho & U. Peintner. 2002.** Two new species of *Gomphidius* from the Western United States and Eastern Siberia. *Mycologia* 94: 1044–1050.
- Miller, O.K. & J.M. Trappe. 1970.** A new *Chroogomphus* with a loculate hymenium and a revised key to section *Floccigomphus*. *Mycologia* 62: 831–836.
- Mohaff K.R., C.L.Cripps & M.L. Lavin. 2008.** Ectomycorrhizal fungi of whitebark pine (a tree in peril) revealed by sporocarps and molecular analysis of mycorrhizae from treeline forests in the Greater Yellowstone Ecosystem. *Botany* 86: 14–25.
- Morse, E.E. 1930.** A new chanterelle in California. *Mycologia* 22: 219–220.
- Morse, E.E. 1941.** A new western *Pholiota*. *Mycologia* 33: 367–370.
- Moser, M.M. 1983.** Keys to Agarics and Boleti. Translated by S. Plant. Publisher Roger Phillips, London. 335 pp.

Moser, M.M. 1997. Contribution to the knowledge of North American *Suillus* species (Basidiomycotina, Boletales). *Mycotaxon* 65: 391–402.

Mueller, G.M., G.F. Bills, & M.S. Foster, 2004. *Biodiversity of Fungi: Inventory and Modeling Methods*. Elsevier Academic Press, Amsterdam. 777 pp.

Mukhin V.A., H. Kotiranta, H. Knudsen, N.V. Ushakova, A.A. Votintseva, P. Corfixen, A. Chlebicki. 2005. Distribution, frequency and biology of *Laricifomes officinalis* in the Asian part of Russia. *Russian Journal of Mycology and Phytopathology* 39: 34–42.

Mushroom Observer. Available at: <http://mushroomobserver.org>.

MycoBank. 2019. www.mycobank.org

MyCoPortal. Mycology Collections Portal. Available at: <http://mycoportal.org>.

NatureServe. 2017. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available <http://explorer.natureserve.org>. (Accessed: 3 May, 2017).

Nguyen, N., E.C. Vellinga, T.D. Bruns & P. Kennedy. 2017. Phylogenetic assessment of global *Suillus* ITS sequences supports morphologically defined species and reveals synonymous and undescribed taxa. *Mycologia* 108: 1216–1228.

Nguyen, N.H., F. Landeros, R. Garibay-Orijel, K. Hansen & E.C. Vellinga, 2013. The *Helvella lacunosa* species complex in western North America: cryptic species, misapplied names and parasites. *Mycologia* 105: 1275–1286. <http://dx.doi.org/10.3852/12-391>.

Niskanen, T., K. Liimatainen, J.F. Ammirati & K. Hughes. 2013. *Cortinarius* section *Sanguinei* in North America. *Mycologia* 105: 344–356.

Noordeloos, M.E. 2011. *Fungi Europaei - Strophariaceae s.l. 13*. Edizioni Candusso, Alassio, Italy. 648 pp.

Norvell, L.L & J. Roger. 1998. The Oregon *Cantharellus* study project: Pacific golden chanterelle preliminary observations and productivity data (1986—1997). *Inoculum* 49: 40.

Norvell, L.L. & R.L. Exeter. 2008. *Phaeocollybia* of Pacific Northwest North America. Salem, OR: U.S. Department of Interior, Bureau of Land Management. 229 pp.

Norvell, L.L. 2000. *Phaeocollybia* in Western North America 1: The *Phaeocollybia*

kauffmanii complex. Canadian Journal of Botany 78: 1055–1076.

Norvell, L.L., S.A. Redhead & J.F. Ammirati. 1994. *Omphalina* sensu lato in North America 1: *Omphalina wynniae* and the genus *Chrysomphalina* 2: *Omphalina* sensu Bigelow. Mycotaxon 50: 379–407.

Nouhra, E. & M.A. Castellano. 1995. NATS truffle and truffle-like fungi 3: *Gastroboletus dinoffii* sp. nov. Mycotaxon. 55: 179–183.

Nuhn, M., M. Binder, A.F.S. Taylor, R.E. Halling & D.S. Hibbett. 2013. Phylogenetic overview of the Boletineae. Fungal Biology 117: 479–511.

Olariaga, I., N.V. Vooren, M. Carbone & K. Hansen. 2015. A monograph of *Otidea* (Pyronemataceae, Pezizomycetes). Persoonia 35: 166–229.

Oregon Biodiversity Information Center. 2016. *Rare, Threatened and Endangered Species of Oregon*. Institute for Natural Resources, Portland State University, Portland, Oregon.

Orton, P.D. 1977. Notes on British Agarics V. Kew Bulletin 31: 709–721.

Osmundson, T. 2016. IUCN Global Fungal Redlist Proposal. *Hygrophorus goetzei*. http://iucn.ekoo.se/iucn/species_view/534690.

Osmundson, T. 2016. IIUCN Global Fungal Redlist Proposal. *Suillus subalpinus*. http://iucn.ekoo.se/iucn/species_view/442468.

Ovrebo, C.L. & K.W. Hughes. 2018. *Tricholoma smithii*, a new species in the *Pardincutis* complex from New Mexico and Colorado. North American Fungi 13: 1–9.

Pacioni, G. & R. Fogel. 1990. *Brauniellula crassitunicata*, a new secotioid species of Gomphidiaceae (Boletales, Basidiomycotina). Mycologia 82: 617–621.

Peck, C.H. 1873. Descriptions of new species of fungi. Bulletin of the Buffalo Society of Natural Sciences 1: 41–72.

Perry, B.A. & D.H. Pfister. 2008. *Chaetothiersia vernalis*, a new genus and species of Pyronemataceae (Ascomycota, Pezizales) from California. Fungal Diversity 28: 65–72.

Perry, B.A. 2002. A taxonomic investigation of *Mycena* in California. Master's thesis, San Francisco State University. 157 pp.

Persoon, C.H. 1794. Dispositio methodica fungorum. Neues Magazin für die Botanik 1: 81–128.

- Persoon, C.H. 1801.** *Synopsis Methodica Fungorum*. Göttingen, Germany. 706 pp.
- Petersen, R.H. 1987.** Contribution toward a monograph of *Ramaria*. VI. The *Ramaria fennica-versatilis* complex. *Sydowia* 40: 197–226.
- Petersen, R.H. & C. Scates. 1988.** Vernally fruiting taxa of *Ramaria* from the Pacific Northwest. *Mycotaxon* 33: 101–144.
- Pfister, D.H., N. Matocec & I. Kušan. 2009.** Integrated studies in the classification of the Pezizaceae. Re-evaluation of the genus *Pachyella* with a new segregate genus *Adelphella*. *Mycologia Montenegrina* 11: 7–17.
- Redberg, G.L., D.S. Hibbett, J.F. Ammirati and R. J. Rodriguez. 2003.** Phylogeny and genetic diversity of *Bridgeoporus nobilissimus* inferred using mitochondrial and nuclear rDNA sequences. *Mycologia* 95: 836–845.
- Redhead, S.A. 1977.** The genus *Mitrula* in North America. *Canadian Journal of Botany* 55: 307–325.
- Redhead, S.A. 1984.** *Arrhenia* and *Rimbachia*, expanded generic concepts, and a re-evaluation of *Leptoglossum* with emphasis on muscicolous North American taxa. *Canada Journal of Botany* 62: 865–892.
- Redhead, S.A. 2013.** Index Fungorum no. 15. <http://www.indexfungorum.org/Publications/Index%20Fungorum%20no.15.pdf>
- Redhead, S.A., J.F. Ammirati, L.L. Norvell, A. Vizzini & M. Contu. 2011.** Validation of combinations with basionyms published by Fries in 1861. *Mycotaxon* 118: 455–458.
- Redhead, S.A & A.H. Smith. 1986.** Two new genera of agarics based on *Psilocybe corneipes* and *Phaeocollybia perplexa*. *Canadian Journal of Botany* 64: 643–647.
- Reha, C. & D. Southworth. 2015.** Stable isotope evidence for the saprotrophic status of the truffle *Schenella pityophilus*. *North American Fungi* 10: 1–7.
- Rocha, L.A., A. Aleixo, G. Allen, et al. 2014.** Specimen collection: an essential tool. *Science* 344: 814–815.
- Sánchez, A. 1967.** The sections *Apostemidium* and *Microstemium* of the genus *Vibrissia* (Fungi). *Journal of Agriculture of the University of Puerto Rico* 51: 79–93.
- Schild, E. 1992.** *Ramaria* studien. *Zeitschrift für Mykologie* 58: 27–52.
- Schwarz, C. 2016.** IUCN Global Fungal Redlist Proposal. *Dendrocollybia pycnora-mella*. http://iucn.ekoo.se/iucn/species_view/1000163.

- Seaver, F.J. 1942.** *The North American Cup-Fungi* (Operculates), with supplement. Reprinted 1978 by Lubrecht & Cramer, Monticello, NY. 377 pp., plus 74 plates.
- Shaffer, R.L. 1957.** *Volvariella* in North America. *Mycologia* 49: 545–579.
- Shanks, K.M. 1996.** New Species of *Tricholoma* from California and Oregon. *Mycologia* 88: 497–508.
- Shanks, K.M. 1997.** *The Agaricales (Gilled Fungi) of California 11. Tricholomataceae II Tricholoma*. Mad River Press, Eureka, CA.
- Siegel, N. & C. Schwarz. 2016.** *Mushrooms of the Redwood Coast: A Comprehensive Guide to the Fungi of Coastal Northern California*. Ten Speed Press, Emeryville, CA. 602 pp.
- Singer, R. & A.H. Smith. 1960.** Studies on secotiaceous fungi. IX. The astrogastraceous series. *Memoirs of the Torrey Botanical Club* 21:1–112.
- Singer, R. 1938.** Notes sur quelques Basidiomycètes. *Revue de Mycologie* 3: 187–199.
- Singer, R. 1949.** *The Agaricales in modern taxonomy*. *Lilloa* 22: 1–832.
- Smith, A.H. 1939.** Studies in the Genus *Cortinarius*. I. Contributions from the University of Michigan Herbarium 2: 5–42.
- Smith, A.H. 1941.** Studies of North American agarics I. Contributions from the University of Michigan Herbarium 5: 1–73.
- Smith, A.H. 1944.** New and interesting Cortinarii from North America. *Lloydia* 7: 163–235.
- Smith, A.H. 1944.** New North American agarics. *Mycologia* 36: 242–262.
- Smith, A.H. 1947.** *North American species of Mycena*. University of Michigan Press, Ann Arbor. 521 pp.
- Smith, A.H. 1957.** A contribution towards a monograph of *Phaeocollybia*. *Brittonia* 9: 195–217.
- Smith, A. H. 1960.** *Tricholomopsis* (Agaricales) in the Western Hemisphere. *Brittonia* 12: 41–70.
- Smith, A.H. 1963.** New astrogastraceous fungi from the Pacific Northwest. *Mycologia* 55: 421–441.
- Smith, A.H. 1965.** New and unusual basidiomycetes with comments on hyphal and

spore wall reactions with Melzer's solution. *Mycopathologia et Mycologia Applicata* 26: 385–402.

Smith, A.H., H.D.Thiers & O.K.Miller. 1965. The species of *Suillus* and *Fuscoboletinus* of the Priest River Experimental Forest and vicinity, Priest River, Idaho. *Lloydia* 28: 120–138.

Smith, A.H. & R. Singer. 1958. Studies on secotiaceae fungi VIII. A new genus related to *Gomphidius*. *Mycologia* 50: 927–938.

Smith, A.H. & W.G. Solheim. 1953. New and unusual fleshy fungi from Wyoming. *Madroño* 12: 103–109.

Smith, A.H. & J.M. Trappe. 1972. The higher fungi of Oregon's Cascade Head Experimental Forest and vicinity—I The genus *Phaeocollybia* (Agaricales) and notes and descriptions of other species in the Agaricales. *Mycologia* 64: 1138–1153.

Smith, A.H. & S.M. Zeller. 1966. A preliminary account of the North American species of *Rhizopogon*. *Memoirs of the New York Botanical Garden*. 14: 1–178.

Smith, M.E., K.J. Schell, M.A. Castellano, M.J. Trappe & J.M. Trappe. 2013. The enigmatic truffle *Fevansia aurantiaca* is an ectomycorrhizal member of the *Albatrellus* lineage. *Mycorrhiza* 23: 663–668.

Smith, M.E., J.M. Trappe & D.M. Rizzo. 2006. *Genea*, *Genabea* and *Gilkeya* gen. nov.: ascomata and ectomycorrhiza formation in a *Quercus* woodland. *Mycologia* 98: 699–716.

Smith, M.E., J.M. Trappe, J.M., D.M. Rizzo & S.L. Miller. 2006. *Gymnomyces xerophilus* sp. nov. (sequestrate Russulaceae), an ectomycorrhizal associate of *Quercus* in California. *Mycological Research* 110: 575–582.

Southworth, D., J.L. Frank, M.A. Castellano, M.E. Smith & J.M. Trappe. 2018. *Balsamia* (Sequestrate Helvellaceae, Ascomycota) in western North America. *Fungal Systematics and Evolution* 2: 11–36.

Storey, M. 2005. Making spore prints. *Field Mycology* 6: 104–106.

Svetasheva, T., T. Hattori & B. Senn-Irlel. 2015. IUCN Global Fungal Redlist Proposal: *Fomitopsis officinalis*. http://iucn.ekoo.se/iucn/species_view/297501.

Thiers, B.M. 2012. http://mycoportal.org/portal/documents/Techniques_for_Preparing_Macrofungi_Specimens_as_Scientific_Vouchers.pdf.

Thiers, H.D. 1975. *California Mushrooms—A Field Guide to the Boletes*. Hafner Press,

New York, NY.

Thiers, H.D. 1979. New and interesting hypogeous and secotioid fungi from California. *Beihefte zur Sydowia* 8: 381–390.

Thiers, H.D. 1984. The genus *Arcangeliiella* Cav. in the western United States. *Sydowia* 37: 296–308.

Thiers, H.D. 1989. *Gastroboletus* revisited. *Memoirs of the New York Botanical Garden* 49: 355–359.

Thiers, H.D. 1997. *The Agaricales (gilled fungi) of California. 9. Russulaceae I.* Mad River Press, Eureka, CA.

Thiers, H.D. & R.E. Halling. 1976. California Boletes V. Two new species of *Boletus*. *Mycologia* 68: 976–983.

Thiers, H.D. & A.H. Smith. 1969. Hypogeous Cortinariid. *Mycologia* 61: 526–536.

Thiers, H.D. & J.M. Trappe. 1969. Studies in the genus *Gastroboletus*. *Brittonia* 21: 244–254.

Thiers, H.D. & R. Watling. 1971. Secotiaceous fungi from western United States. *Madroño* 21: 1–9.

Trappe, J.M. 1975. Generic synonyms in the Tuberales. *Mycotaxon* 2: 109–12.

Trappe, J.M. & M.A. Castellano. 2000. New sequestrate Ascomycota and Basidiomycota covered by the Northwest Forest Plan. *Mycotaxon* 75: 153–179.

Trappe, J.M. & G. Guzmán. 1971. A newly determined species of *Elaphomyces* from Oregon. *Madroño* 21: 128–130.

Trappe, J. M., T. Lebel & M.A. Castellano. 2002. Nomenclatural revisions in the sequestrate russuloid genera. *Mycotaxon* 81: 195–214.

Trappe, J.M., R. Molina, D.L. Luoma, E. Cázares, D. Pilz, J.E. Smith, M.A. Castellano, S.L. Miller & M.J. Trappe. 2009. *Diversity, Ecology, and Conservation of Truffle Fungi in Forests of the Pacific Northwest.* United States Department of Agriculture. Forest Service. Pacific Northwest Research Station. General Technical Report. PNW-GTR-772.

Trappe, M.J., M.E. Smith & E.A. Hobbie. 2015. Exploring the phylogenetic affiliations and the trophic mode of *Sedecula pulvinata* (Sedeculaceae). *Mycologia* 107: 688–696.

United States Department of Agriculture, Natural Resources Conservation Service. 2019. The PLANTS Database. National Plant Data Team, Greensboro, NC. <http://plants.usda.gov>.

Vellinga, E. 2015. *Bridgeporus nobilissimus*. The IUCN Red List of Threatened Species 2015: <http://www.iucnredlist.org/details/76195622/0>.

Vellinga, E. 2015. *Lepiota viridigleba*. The IUCN Red List of Threatened Species 2015: e.T76195538A97167996. <http://www.iucnredlist.org/details/76195538/0>.

Vidal, J.M. 2005. *Arcangeliella borziana* and *A. stephensi*, two gasteroid fungi often mistaken. A taxonomic revision of *Lactarius*-related sequestrate fungi. *Revista Catalana de Micologia* 26: 59–82.

Wagner, T. & M. Fischer. 2002. Proceedings towards a natural classification of the worldwide taxa *Phellinus* s.l. and *Inonotus* s.l., and phylogenetic relationships of allied genera. *Mycologia* 94: 998–1016.

Wang, Z., M. Binder & D.S. Hibbett. 2005. Life history and systematics of the aquatic discomycete *Mitruia* (Helotiales, Ascomycota) based on cultural, morphological, and molecular studies. *American Journal of Botany* 92: 1565–1574.

Warwell, M.V., G.E. Rehfeldt & N.L. Crookston. 2007. Modeling contemporary climate profiles of whitebark pine (*Pinus albicaulis*) and predicting responses to global warming. Proceedings of the conference whitebark pine: a Pacific Coast perspective. 2006 August 27–31; Ashland, OR U.S. Department of Agriculture, Forest Service, Pacific Northwest Region, Portland, OR: 139–142.

Washington Natural Heritage Program 2011. List of Macrofungi. Department of Natural Resources, Olympia, WA. https://www.dnr.wa.gov/publications/amp_nh_macrofungi.pdf. Access date: February–June, 2017.

Waters J.R., K.S. McKelvey, D.L. Luoma & C.J. Zabel. 1997. Truffle production in old-growth and mature fir stands in northeastern California. *Forest Ecology and Management* 96: 155–166.

Watling, R. & N.M. Gregory. 1987. *British Fungus Flora Agarics and Boleti 5 Strophariaceae and Coprinaceae*. Royal Botanic Garden, Edinburgh. 121 pp.

Whetzel, H.H. 1945. A synopsis of the genera and species of the Sclerotiniaceae, a family of stromatic inoperculate discomycetes. *Mycologia* 37: 648–714.

Wilson, A.W. & D.E. Desjardin. 2005. Phylogenetic relationships in the gymnopoid and marasmioid fungi (Basidiomycetes, euagarics clade). *Mycologia* 97: 667–679.

Wood, M.G. & F.A. Stevens. 2017. Mykoweb, Fungi of California. http://mykoweb.com/CAF/species/Bovista_californica.html.

Wood, M.G. & F.A. Stevens. 2017. Mykoweb, Fungi of California. http://mykoweb.com/CAF/species/Chaetothiersia_vernalis.html.

Wood, M.G. & F.A. Stevens. 2017. Mykoweb, Fungi of California. http://mykoweb.com/CAF/species/Cortinarius_sierraensis.html.

Wood, M.G. & F.A. Stevens. 2017. Mykoweb, Fungi of California. http://mykoweb.com/CAF/species/Galeropsis_polytrichoides.html.

Wood, M.G. & F.A. Stevens. 2017. Mykoweb, Fungi of California. http://mykoweb.com/CAF/species/Mitrula_elegans.html.

Wood, M.G. & F.A. Stevens. 2017. Mykoweb, Fungi of California. http://mykoweb.com/CAF/species/Leratiomyces_cucullatus.html.

Zeller, S.M. 1939. New and noteworthy Gasteromycetes. *Mycologia* 31: 1–32.

Zeller, S.M. 1941. Further notes on fungi. *Mycologia* 33: 196–214.

Zeller, S.M. 1943. North American species of *Galeropsis*, *Gyrophragmium*, *Longia*, and *Montagnea*. *Mycologia* 35: 409–421.

Zeller, S.M. 1944. Representatives for the Mesophelliaceae in North America. *Mycologia* 36: 627–637.

Zeller, S.M. 1947. More notes on Gasteromycetes. *Mycologia* 39: 282–312.

Zeller, S.M. 1948. Notes on certain Gasteromycetes, including two new orders. *Mycologia* 40: 639–668.

Zeller, S.M. & C.W. Dodge. 1924. *Leucogaster* and *Leucophleps* in North America. *Annals of the Missouri Botanical Garden* 16: 389–410.

Occurrence Table

Occurrence data comes from herbarium collections listed on MyCoPortal (www.mycportal.org), and observations from iNaturalist (<https://www.inaturalist.org>) and Mushroom Observer (www.mushroomobserver.org). Accessed February–August 2017, and examination of collections of specimens at the SFSU herbarium in April 2017.

Ranks are based on Oregon Biodiversity Information Center. 2016. *Rare, Threatened and Endangered Species of Oregon*. Institute for Natural Resources, Portland State University, Portland, Oregon, and Washington Natural Heritage Program 2011. *List of Macrofungi*. Department of Natural Resources, Olympia, WA. https://www.dnr.wa.gov/publications/amp_nh_macrofungi.pdf. Accessed 1st Feb. 2017.

Status of the Survey & Manage (S&M) species is based on the January 2001 Record of Decision list (Castellano et al. 2003).

Unless otherwise noted, taxonomy is based on the most current taxonomic treatments, referenced to the fungal name databases: MycoBank and Index Fungorum.

An asterisk symbol (*) denotes photographic records only.

FORESTS & PARKS	SPECIES										
	<i>Albatrellus ellisi</i>										
	<i>Aphroditeola olida</i>										
	<i>Arcangiella crassa</i>										
	<i>Arcangiella parva</i>										
	<i>Arcangiella saylorii</i>										
	<i>Arrhenia lobata</i>										
	<i>Baeospora myriodophylla</i>										
	<i>Balsamia nigrans</i>										
	<i>Boletus cocciginus</i>										
	<i>Bondarzewia occidentalis</i>										
Global Rank	G4		G2G4				G5		G2G4		
WA Natural Heritage											
OR Natural Heritage	S3		S1				S1		S2		
S&M (Y/N)	Y	N	Y	N	N	N	Y	Y	N	Y	
Six Rivers NF											1
Klamath NF	1		3								3
Mendocino NF											1
Shasta-Trinity NF	1	1*	3								4
Modoc NF											
Lassen NF	1										3
Plumas NF	1						1				1
Tahoe NF	3	1*	3	4			1	1		1	2
Eldorado NF			5			1					2
Stanislaus NF		1*	3	1						1	1
Lk. Tahoe Basin Mgt. Unit	1										
Humboldt-Toiyabe NF											
Inyo NF											
Sierra NF			3						2		
Sequoia NF											
Angeles NF											
San Bernardino NF											
Los Padres NF											
Cleveland NF											
Redwood Ntl. & St. Parks											2
Lassen Volcanic NP											
Yosemite NP	1										1
Sequoia NP											
Kings Canyon NP	1										
Other California locations		2	2						6	3	6

	<i>Bovista californica</i>	<i>Bridgeoporus nobilissimus</i>	<i>Calocybe naucoria</i>	<i>Calvatia lloydii</i>	<i>Cantharocybe gruberi</i>	<i>Chaethiersia vernalis</i>	<i>Chloroscypha flavida</i>	<i>Choiromyces atveolatus</i>	<i>Chroogomphus albipes</i>	<i>Chroogomphus loculatus</i>	<i>Chrysomphalina grossula</i>	<i>Cortinarius cyanites</i>	<i>Cortinarius luteicolor</i>
		GNR			GNR		G3	G3	G3	G3	G3G4	G3G4	
		S2			S2		S3	S2	S1	S3	S1?	S2S3	
	N	Y	N	N	N	N	Y	Y	N	Y	Y	Y	N
			1										
			1					3					
					2*	2	4	1	1	1		1	
	1							2					
	1								1				
			1	1	3		4	4				1	
					1*	1		2					
	1			2		1						1	
			1										
	2								1				
									2				
									2				
				1					1				
												1	
			1										
			1						1			1	1
			5										
	1		1	1	2	1		6	2		3	4	

FORESTS & PARKS	SPECIES	<i>Cortinarius olympianus</i>	<i>Cortinarius sierraeensis</i>	<i>Cortinarius trucheensis</i>	<i>Cortinarius velatus</i>	<i>Cortinarius verrucisporus</i>	<i>Dendrocollybia pycnoramella</i>	<i>Dendrocollybia racemosa</i>	<i>Destuntzia rubra</i>	<i>Destuntzia saylorii</i>	<i>Elaphomyces subbruscoides</i>
Global Rank	GNR								G3		G2G1
WA Natural Heritage	S2										
OR Natural Heritage									SH		S1S2
S&M (Y/N)	Y	N	N	N	Y	N	Y	Y	Y	N	Y
Six Rivers NF								1			
Klamath NF	6							3			
Mendocino NF											
Shasta-Trinity NF						3		8			
Modoc NF						1					
Lassen NF						1					
Plumas NF											
Tahoe NF			1		10			5	1	1	
Eldorado NF		1		1	3			1			
Stanislaus NF	1			1*							
Lk. Tahoe Basin Mgt. Unit								1			
Humboldt-Toiyabe NF		1									
Inyo NF											
Sierra NF				2	1						
Sequoia NF											
Angeles NF											
San Bernardino NF										2	
Los Padres NF											
Cleveland NF											
Redwood Ntl. & St. Parks											
Lassen Volcanic NP						1					
Yosemite NP		2				1					
Sequoia NP											
Kings Canyon NP											
Other California locations								30+	12		

	<i>Fevansia aurantiaca</i>													
	<i>Galeropsis polytrichoides</i>													
	<i>Gastroboletus amyloideus</i>													
	<i>Gastroboletus citrinobrunneus</i>													
	<i>Gastroboletus dinoffii</i>													
	<i>Gastroboletus ruber</i>													
	<i>Gastroboletus vividus</i>													
	<i>Genea gardneri</i>													
	<i>Genea harknessii</i>													
	<i>Gomphidius pseudoflavipes</i>													
	<i>Gymnomyces subalpinus</i>													
	<i>Gymnomyces xerophilus</i>													
	<i>Hohenbuehelia mastrucata</i>													
	<i>Hydnotryopsis setchellii</i>													
	G1													
	S1													
	Y	N	N	N	N	N	Y	Y	N	N	N	N	N	N
		3	1			2	1	2				1		
			1	1		1						1		
				1*										
		2	1	1		2	1	1	2					1
		3	1											
		1												
		1*												
	1	2	1					2			1			
		1												
									1					
						1								
			3			2	3							
			1				2							
									1					
									15	7			2	4
														2

FORESTS & PARKS	SPECIES											
	<i>Hygrophorus caeruleus</i>	<i>Hygrophorus calophyllus</i>										
Global Rank			GNR									
WA Natural Heritage												
OR Natural Heritage			SNR									
S&M (Y/N)	Y	N	N	N	Y	N	N	N	N	N	N	
Six Rivers NF							2					
Klamath NF		1*					1*					
Mendocino NF							1*					
Shasta-Trinity NF	3		1		1		8					
Modoc NF	2											
Lassen NF	1*	1					2					
Plumas NF							2					
Tahoe NF		1	2			1		2	1	2		
Eldorado NF	3*		1				3					
Stanislaus NF	3*							1				
Lk. Tahoe Basin Mgt. Unit									1	2		
Humboldt-Toiyabe NF												
Inyo NF												
Sierra NF		1										
Sequoia NF												
Angeles NF												
San Bernardino NF												
Los Padres NF												
Cleveland NF				2								
Redwood Ntl. & St. Parks												
Lassen Volcanic NP	1*		7				2					
Yosemite NP	1		1			1	2					
Sequoia NP							1*					
Kings Canyon NP							1					
Other California locations		3		2			8*	6				

<i>Lepiota viridigleba</i>														
<i>Leptonia cyanea var. occidentalis</i>														
<i>Leratiomyces cucullatus</i>														
<i>Leucogaster microsporus</i>														
<i>Marasmius thiersii</i>														
<i>Mitrula elegans</i>														
<i>Mycena hudsoniana</i>														
<i>Mycetinis abplanatipes</i>														
<i>Mycolevis sicigleba</i>														
<i>Mythicomyces corneipes</i>														
<i>Otidea smithii</i>														
<i>Pachycudonia monticola</i>														
<i>Pachycudonia spatulata</i>														
<i>Pachyella babingtonii</i>														
	G1			G3			G3			G3G4	G3			
	S1			S3			S1S2			S2	S2			
	N	N	N	Y	N	N	Y	Y	N	Y	Y	Y	N	N
												1		
								2	3					
		2												
	1	2	1	1			1	2		2				
										1				
	1	1	2		2	1		3	4	1*		1	1	2
			3			2								
			2											
							1*		2					
										1				
		1												
			1											
			2			1								
		2		1	2	2*			2		6		5	

FORESTS & PARKS	SPECIES	<i>Phaeocollybia benzokuffmani</i>	<i>Phaeocollybia gregaria</i>	<i>Phaeocollybia olivacea</i>	<i>Phaeocollybia pseudofestiva</i>	<i>Phaeocollybia scatesiae</i>	<i>Porodaedalea cancriformans</i>	<i>Protogauteria substriata</i>	<i>Ramaria amyloidea</i>	<i>Ramaria aurantiscenscens</i>	<i>Ramaria coulterae</i>
Global Rank		G1G2							G3	G3	
WA Natural Heritage									S1	S1	
OR Natural Heritage		S1S2								S3	
S&M (Y/N)	N	Y	Y	Y	Y	Y	N	N	Y	Y	Y
Six Rivers NF		2	15+	2			2				
Klamath NF		2	15+	3					1	1	
Mendocino NF											
Shasta-Trinity NF	2*	1	20+			1	1				4
Modoc NF											2
Lassen NF											
Plumas NF											
Tahoe NF			3					2			
Eldorado NF			1								
Stanislaus NF								1			
Lk. Tahoe Basin Mgt. Unit											
Humboldt-Toiyabe NF											
Inyo NF											
Sierra NF								1			1
Sequoia NF											
Angeles NF											
San Bernardino NF											
Los Padres NF											
Cleveland NF											
Redwood Ntl. & St. Parks		3			1						
Lassen Volcanic NP											
Yosemite NP											
Sequoia NP											
Kings Canyon NP											
Other California locations		3		33	8	5				1	

	<i>Ramaria cyaneigranosa</i>	<i>Ramaria largentii</i>	<i>Ramaria maculatipes</i>	<i>Ramaria purpurissima</i>	<i>Ramaria rubripermanens</i>	<i>Ramaria thiersii</i>	<i>Rhizopogon abietis</i>	<i>Rhizopogon brunneiniger</i>	<i>Rhizopogon ellipsosporus</i>	<i>Rhizopogon flavofibrillosus</i>	<i>Rubroboletus haematinus</i>	<i>Rubroboletus pulcherrimus</i>	<i>Russula mustelina</i>	<i>Schenella pityophila</i>
	G4	G3	G3			G3	G2G4	G2G4	G2G3	G2G3		G3		
	S1		S1									S1		
		S2?	S2?			S2?	S1S3	S1S3	S1S2	S2				
	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	N
										1				
		1	1		2		1	1		1	2		1	
				2	3				1					
	1	1	1			1					9	1	5	
											2			
											1*			
						4					2		7	1
											3		4	
					2						1		2	
								1			1		1	
	1											2		
		1				1					2		1	
											1*			
	3		2		1	1	1	1			2	13	1	3

FORESTS & PARKS	SPECIES										
	<i>Schenella simplex</i>	<i>Sclerotinia sulcata</i>	<i>Sedecula pulvinata</i>	<i>Stagnicola perplexa</i>	<i>Stropharia hornemannii</i>	<i>Stropharia kauffmanii</i>	<i>Suillus discolor</i>	<i>Suillus imbellus</i>	<i>Suillus subalpinus</i>	<i>Suillus suilloides</i>	
Global Rank			G3	G3G4				GH			
WA Natural Heritage											
OR Natural Heritage			S1	S1S2				SH			
S&M (Y/N)	N	N	Y	Y	N	N	N	Y*	N	Y*	
Six Rivers NF											
Klamath NF										1	
Mendocino NF											
Shasta-Trinity NF	1	2	2	1	1*	1*				1	
Modoc NF											
Lassen NF	2		2								
Plumas NF		1									
Tahoe NF	3	1	6		1	1					
Eldorado NF			2			3				1	
Stanislaus NF			2			2					
Lk. Tahoe Basin Mgt. Unit											
Humboldt-Toiyabe NF											
Inyo NF							2			1	
Sierra NF	6		1							1	
Sequoia NF											
Angeles NF											
San Bernardino NF			1								
Los Padres NF											
Cleveland NF											
Redwood Ntl. & St. Parks					1*						
Lassen Volcanic NP										4	
Yosemite NP	1								1		
Sequoia NP											
Kings Canyon NP											
Other California locations			1			4				1	

<i>Trappea phillipsii</i>												
<i>Tricholoma apium</i>												
<i>Tricholoma dulciolens</i>												
<i>Tricholoma mutabile</i>												
<i>Tricholoma venenatum</i>												
<i>Tricholomopsis fulvescens</i>						G2G3			GNR			
<i>Tuber castellanoi</i>						S1						
<i>Tylophilus ammiratii</i>						SH			SNR			
<i>Vibrissea filisporia</i>												
<i>Vibrissea truncorum</i>												
<i>Volvariella surrecta</i>												
<i>Xerocomellus rainisii</i>												
	N	N	N	N	Y	Y	N	N	N	N	N	N
		1*		1*		1	1	1				
	1		1									
	2							1				1
	1					1			1*			
									1*			
	1		1	1	4			1?				1*
										1		
						1						
							1					
	1											
		1										1
	6	2*	2*	4	2		1	3			2	1

