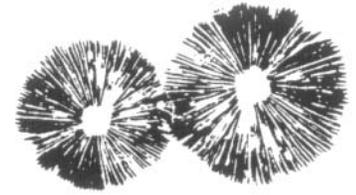


SPORE PRINTS

BULLETIN OF THE PUGET SOUND MYCOLOGICAL SOCIETY
Number 432 May 2007



PRESIDENT'S MESSAGE

Patrice Benson

Spring is really here! Folks have been asking Hildegard Hendrickson to send identification help to various sightings of the spring fungi: morels, *Amanita pantherina*, etc. She has obliged with rescuing them from their morels, which she shared last evening with the board.

Our first field trip had more than the usual attractions. Thanks to Alissa Allen and Kathy Lennebacker for teaching the interested field-trippers all about dyeing with mushrooms. Hildegard and Brian Luther taught folks how to identify their spring foraging products. Thanks for all of your efforts.

Brian, along with Coleman Leuthy, will be hosting us at their adjacent properties at Eagle Creek for the two-day field trip May 26–27. Details in this issue.

Bernice Velategui and Pacita Roberts are hard at work updating the database prior to printing the roster, which should be available at the membership meeting in May. Please send a message to one of these hard working members if you need to change your contact information.

We will have an extra experimental field trip on June 9 at Swauk Creek Campground, compliments of Doug and Teresa Ward with the ID help of Hildegard Hendrickson. Please see details on page 3 of this issue of *Spore Prints*.

The intermediate identification classes are under way, thanks to Colin Meyer.

We have a new co-chair of book sales: Lorelei Wehl, who will work with Younghee Lee to bring you great books and mushroom related items to purchase for your own use or for gifts. Check out the books sales tables at our regular meetings.

Applications for mushroom hunting permit for the Wenatchee National Forest will be available at the May meeting. You will need to fill out the form and leave them at the meeting. Please bring your ID to write the numbers on the forms. The applications will be sent in a group to the ranger station. They will be signed and returned to me. I will bring them to the field trip at Eagle Creek.

Note that if you are planning to hunt the the Tripod burn, you will need a different permit for that area. I am working on getting the permit needed for that too. Thanks to Mick Mueller for helping arrange for the permits.

Work is in progress with the Master Gardeners to share their Monday "ID" hours at CUH. If there are volunteers and interest we will join them in identifying mushrooms while they answer gardening questions and identify plants brought in to CUH.

Exhibit Chair Ron Post is at work already preparing for the 2007 Mushroom Exhibit which is October 13–14 at CUH. Please save the dates!

Doug Ward is implementing a new plan for the 30 minutes before the membership meetings by organizing a short meeting for new members as well as seasoned ones to relay basic information

about some aspect of mushroom hunting or ID. This should serve as a friendly way to meet some of the other members as well as learn a thing or two. Read about the next meeting's plan on page 2 of this issue.

And last, I would like to invite our experienced members to participate in our field trips by offering to cohost and to be guides in the field for new members. Please arrive at the field trip sites by 9 AM to participate in the informal guided foraging. I remember very vividly and fondly my first trips nearly 30 years ago where an experienced member led me on mushroom walks and taught me to look at the mushrooms.

CALLING ALL SHOW COMMITTEE PEOPLE

Ron Post

Because the annual exhibit will move back to CUH this fall, I am holding an organizational meeting there for all committee chairs and others who are interested. The time is 5 PM on June 12, the day of the June PSMS membership meeting. We will have refreshments, and we will walk through some areas at CUH to discuss logistics for the October exhibit.

If you are interested in helping to chair a committee at the show (we have about 20 committees and really need your help), or if you have chaired a committee and you can work this meeting into your schedule, I would appreciate your attendance in June. Call me with any questions (206-370-4487).

A GATHERING OF GREEN GOURMETS

Jean Gauthier

Hoping to forage further afield? If you would enjoy making and sharing dishes including wild-collected roots, bulbs, tubers, shoots, greens, pollen, flowers, pods, nuts, fruits, and seeds as well as mushrooms, we want to hear from you. Along with Arthur Lee Jacobson, I am interested in starting a Seattle-based foraging group featuring a monthly potluck and lecture.

All interested parties are welcome, from curious beginners to experienced edibles collectors and cooks. We hope to share stories and insights, and most of all knowledge and unique, delicious food. An important component of this group will be to include hardy horticultural species planted around the city along with the more frequently collected native plants and edible weeds. My academic background is in both botany and horticulture, so we both hope to assist neophyte collectors in identifying and familiarizing themselves with plants that may be encountered in this region, as well as plants to avoid.

Our first meeting/potluck/brainstorming session is slated for late May, with an exact date, time and location to be announced. We invite you to join us in adding vascular plants to your collecting basket! For more information contact me at jeangaut@comcast.net or 206-326-8120 or Arthur Lee Jacobson at (206) 328-8733 or ALJ@consultant.com.

Spore Prints

is published monthly, September through June by the

PUGET SOUND MYCOLOGICAL SOCIETY

Center for Urban Horticulture, Box 354115
University of Washington, Seattle, Washington 98195
(206) 522-6031 <http://www.psms.org>

User name: Password:

OFFICERS: Patrice Benson, President
Milton Tam, Vice President
John Goldman, Treasurer
Dennis Oliver, Secretary

TRUSTEES: Molly Bernstein, Kevin Bernstein,
Colleen Compton, Marilyn Droege,
Brenda Fong, Jamie Notman,
Cynthia Nuzzi, Lynn Phillips,
Kim Traverse, Doug Ward
Ron Post (Immed. Past Pres.)

ALTERNATE:

SCI. ADVISOR: Dr. Joseph F. Ammirati

EDITOR: Agnes A. Sieger, 271 Harmony Lane,
Port Angeles, WA 98362
sieger@att.net

Annual dues \$25; full-time students \$15

MEMBERSHIP MEETING

Tuesday, May 8, 2007, at 7:30 PM at the Center for Urban Horticulture, 3501 NE 41st Street, Seattle.

Our featured speaker this month will be our scientific advisor, Dr. Joseph Ammirati, who will talk on "Spring and Snow Bank Fungi of the Pacific Northwest." Dr. Ammirati, a mushroom taxonomist in the Biology Department at the University of Washington, works primarily on *Cortinarius*, but also has broader interests in Agaricology. He is respected for his work with *Cortinarius*, toxicology and forest ecology. His revision of *The New Savory Wild Mushroom* earned him a certificate of achievement from the Society for Technical Communication, and he is co-author of *Poisonous Mushrooms of the Northern United States and Canada*. Dr Ammirati is a constant supporter of mushroom hobbyists, speaking at numerous meetings, banquets, and forays. He was the advisor for our Barlow Pass study, the Oregon chanterelle project, and the Pacific Northwest Key Council. He has been foray mycologist for several North American Mycological Association forays and for amateur societies innumerable times. He has spoken at our society several times in the past and is always interesting and informative.



Would persons with last names beginning with the letters L to K please bring refreshments for the social hour?

CALENDAR

May 8 Membership Meeting, 7:30 PM, CUH
May 12 Field Trip, 29 Pines
May 14 Board Meeting, 7:30 PM, CUH Boardroom
May 22 *Spore Prints* deadline
May 26–27 Field Trip, Eagle Creek
June 9 Field Trip, Swauk Creek
June 12 Membership Meeting, 7:30 PM, CUH

BOARD NEWS

Dennis Oliver

This was the first meeting of the new board, so it was a time of greetings and review of ongoing projects. The introductory mushroom class was well attended and the intermediate class is going well. Lorelei Wehl has volunteered to co-chair book sales assisting Younghee Lee. Patrice is working to obtain collecting permits for the Wenatchee National Forest and hopes to have them available at the May meeting. The endowment with the Burke Museum for a curatorship and support for the mycological herbarium has been finalized and donations can be made. The new roster is near completion and change cards will be available at the May meeting. Finally, it's never too early to be discussing the annual show, so costs, possible speakers, and location of various activities were discussed.



PRE-MEETING MUSHROOM SESSION Doug Ward

We have reinstated the introductory mushroom training sessions before the monthly meetings to help newer members become familiar with some of the basics of mushrooming and mushrooms. Starting with the May meeting, Hildegard Hendrickson will hold sessions in the back of the meeting room beginning at 7:00 PM. There is no need register—just show up. This is *not* designed to take the place of the beginning ID classes but as a way to get you started.

SPRING FIELD TRIPS

Colleen Compton

I am getting excited about possibly finding morels at 29 Pines and Eagle Creek. Also, an additional spring field trip has been added for June 9 (see page 3). We will provide more field trips if members request them and step up to host them (see the item about hosting the upcoming field trip to Swauk Creek on June 9). A club like ours thrives on enthusiastic volunteers, and we are eager to introduce new members to the art and skill of foraging for wild mushrooms. Hosting is easy and fun. It is even better when two individuals or couples co-host so both have time for hunting, too.

If you would care to host at future field trips call Colleen Compton at (206-417-4540) or e-mail to colleen.compton@att.net. We will provide sign-up sheets at future membership meetings for specific dates and trips.



ay is Morel Month!



May 12

29 Pines Forest Camp
(elev. 2500 ft., 102 mi. east of Seattle)

Directions: Take I-90 over Snoqualmie Pass to exit # 85. Follow signs to Hwy. 970 and continue 4.5 miles. Turn left on Teanaway River Road. Proceed about 6 miles, bearing right at the fork onto the Teanaway North Fork Road. Continue another six miles just past the new fish hatchery on the left and Jack Creek. Twenty-nine Pines is located on the left. There is no shelter or water, but there are outhouses. Camping is free. You may wish to bring a potluck dish or goodies to share with other mushroomers. Plenty of firewood is nearby. Ron Post will host along with Lynn Elwell. If you wish to car-pool to 29 Pines call Ron Post at (206) 370-4487 and he will endeavor to arrange it.

May 26-27

Eagle Creek
(elev. 1800 ft.)

Coleman Leuthy and Brian Luther have again generously offered to let us use their property on Eagle Creek which is located 7 miles from Leavenworth. Camping, of course, is free. Emily Routledge will host.

If you would care to host at future field trips call Colleen Compton at (206-417-4540) or e-mail to colleen.compton@att.net. We will provide sign-up sheets at future membership meetings for specific dates and trips.

Driving Directions: Take your favorite route to Leavenworth: (1) Hwy. 2 over Stevens Pass or (2) 1-90 east to Cle Elum, then Hwy 97 north over Blewett Pass to Hwy. 2. Proceed west to Leavenworth. Coming from Stevens Pass, continue through town toward the east end. Before the Safeway, turn left (north) at the traffic light onto Chumstick Road (also called Chumstick Hwy.). Coming from Blewett Pass, drive past the Safeway and continue another ¼ mile or so to Chumstick Road on your right. Turn right and proceed another 2 miles (¼ mile past the railroad trestle), and turn right onto Eagle Creek Road. Follow the road for approximately 4½ miles. Look for an old barn with a dark red metal roof and several other buildings. Turn right at the PSMS signs.



June 9

Swauk Creek Campground
(2500 ft elev, 110 mi. east of Seattle)

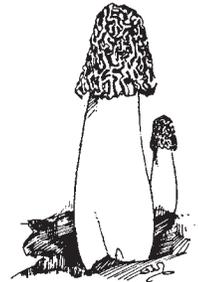
In response to requests for another field trip, an “unhosted” field trip to Swauk Creek Campground has been scheduled for Saturday, June 9. Unhosted means there will not be the usual coffee, goodies, and potluck associated with a hosted field trip, but there will be someone available to suggest places to hunt until about 10:00 AM, and there will be an identifier available to identify your treasures starting about noon. **For this to work, experienced members are needed to take small groups of newer members out into the field.**



CARNATION FIELD TRIP REPORT

Hildegard Hendrickson

On Saturday, April 7, between 40 and 50 mostly new members attended the season’s first field trip. I gave a short talk about cottonwoods and the mushrooms we might find. I also talked about equipment: compass or GPS (if you can afford it), a whistle, a basket or bucket (no plastic bags), a knife, a brush, wax paper, and foil, as well as clothing (raingear, waterproof boots, hat) and, later in the spring season, insect repellent.



We split into two groups. Ted and Gwen Heib agreed to lead one group on the trails along the Snoqualmie River. I took a group to a private location along the Tolt River. It was evident that we were about a week late because some *Verpas* were beginning to dry up, but since the white stems were clearly visible, it helped the new members to see them.

Brian Luther had taken a new route to the field trip site, and arrived about an hour late. When we returned to the shelter, Brian was already identifying specimens, as well as cautioning new members about eating *Verpas* and emphasizing that all spring mushrooms must be cooked before eating them.

The list of mushrooms brought in was short: *Agrocybe praecox*; *Coprinus micaceus*; *Ganoderma applanatum*; *Hypholoma fasciculare* (Clustered Woodlover); *Inocybe* sp.; *Mycena sanguinolenta*; several other *Mycena* sp.; *Omphalina ericetorum*, the lichenized gilled mushroom which is obligately associated with the unicellular green alga genus *Coccomyxa*; *Pleurotus ostreatus* (Oyster Mushrooms); *Polyporus badius*; *Polyporus elegans*; *Polyporus varius*; *Psathyrella* sp.; *Ptychoverpa bohemica* (*Verpas*); *Stereum* sp.; *Trametes versicolor*; *Tubaria* sp.; *Tremella mesenterica* (witch’s butter, a jelly fungus left over from fall), as well as a *Peziza*, a lichen, and *Ustulina (Kretzschmaria) deusta*.

An unusual, early spring collection of several lovely and fragile *Mycena amicta* specimens was found, but no other unusual or rare fungi were collected.

Several people found very nice, edible sized clumps of prime Oyster Mushrooms (*Pleurotus ostreatus*) growing on downed cottonwood, alder, and maple. For some it was the first time they’d found Oyster Mushrooms, and Brian was asked how to best prepare them.

Brian confirmed the collection of *Naematoloma (Hypholoma) fasciculare* by using a chemical spot test showing an instant color change reaction, which he demonstrated before the whole group.

We practiced the possible new field trip format by not having a formal host. I brought a few munchies, coffee, and juice, and Brian served his favorite apples (Pink Lady variety).

For the first time in three years, it did not rain on this field trip.

*I once knew a hunter named Sven
He only picked now and then
He would pick without thinking
Then think without picking
His approach was totally Zen*

— Charmoon Richardson

SOMA News, Sonoma Co. Myco. Assoc., Jan. 2005

ITEMS OF INTEREST

Northeastern Mycological Foray, August 9–12, 2007, University of Maine, Orono Campus, Orono, Maine. Hosted by The Maine Mycological Association, Inc. See <http://www.nemfdata.org/>.

Maine Mushroom Course. The Humboldt Field Research Institute (www.eaglehill.us), Steuben, Maine, will have a course given by Rosalind Lowen, Lawrence Leonard, and Edward Bosman called “Mushrooms for Naturalists” from August 12–18, 2007.

Field Mycology Course. The State University of New York College at Cortland is offering a Field Mycology course at Raquette Lake in the Adirondacks from July 13–27, 2007. Instructor: Dr. Timothy J. Baroni, Professor of Biological Sciences. For detail contact Dr. Baroni at BaroniT@cortland.edu.

Breitenbush Mushroom Conference, October 18–21, 2007, Breitenbush Hot Springs, Oregon. Guided field trips, lectures, cooking & preservation, identification workshops, and soaking in the hot waters of the natural springs. Treat yourself to an educational, delicious, and relaxing autumnal event in the midst of the old growth forests of Oregon. For reservations & information visit www.breitenbush.com, phone 503-854-3320, or contact Patrice Benson at patrice.benson@comcast.net or 206-819-4842.

SNOWBANK FUNGI OF WESTERN NORTH AMERICA: COLD BUT NOT FROZEN

Cathy Cripps

Botanical Electronic News, #377, April 12, 2007
<http://www.ou.edu/cas/botany-micro/ben/ben377.html>

Snowbank Fungi

One of my first encounters with the “snowbank fungi” was as I was glissading down a snowy slope, when suddenly just before I hit bare ground, hordes of shiny gray mushroom heads appeared unexpectedly from the snow glistening in the high elevation sunlight. It quite took my breath away.

Later I learned that deep in the high elevation forests of western North America where snowbanks linger long into summer months, a unique group of macrofungi flourishes on the melt waters released by the white remnants of winter. Fruiting bodies initiate in the subnivean zone and push up through the snow as it melts around them forming small caverns. At the snow–soil interface temperatures hover around freezing. As warm air and sun reduce the snowbanks, an array of mushrooms and cup fungi is revealed along margins in the adjacent melt-water zone. As the season progresses they remain as silent sentinels marking the outline of defunct snowbanks with their bodies.

The “snowbank fungi” are a consistent feature of high elevation western conifer forests in spring and early summer. They are reported primarily from the Rocky Mountains and Cascade Range, but their distribution stretches from southern Canada to northern New Mexico at elevations of 1500 to 3800 m. I have observed them en masse in Colorado, Idaho, Montana, Wyoming, and Canada and they are well known in the Pacific Northwest, the Sierra Nevada range of California, and the Wasatch Mountains of Utah. Many of the snowbank fungi are endemic to western North America. Others also occur outside the West but not in this unique ecological niche. Moser (2004) states “we have nothing comparable in Europe.”

The “snowbankers” appear to be a unique western North American phenomenon. They are not associated with the open snow beds of arctic and alpine habitats, nor are they associated with glaciers. They are not the typical spring mushroom flora, although a few

overlap chronologically with this group. They have not been reported from the eastern USA as an ecological group.

The “snowbank fungi” are well distributed where certain conditions are met. They proliferate in regions of high elevation with short, cold summers where snowbanks remain until July. Sufficient elevation is necessary for a deep snow pack in mature forests suffused with downed logs and abundant litter and woody debris. Spring and summer nights must be cool enough to retain the snowbanks, and days warm enough to provide melt water for the fungi, which fruit as the soil warms and dries. The fungi can occur on steep slopes or level ground, but snowbanks persist longer on northern slopes and in deep shade where fruiting is protracted. Fruiting can stretch into July and August at higher elevations. The “snowbank fungi” are associated mostly with the spruce-fir zone (mixed conifers), and particularly with Engelmann spruce (*Picea engelmannii* Engelm.), subalpine fir (*Abies lasiocarpa* [Hook.] Nutt.), and lodgepole pine (*Pinus contorta* Laud.), although they also occur in mixed whitebark pine (*Pinus albicaulis* Engelm.) forests. It is this particular set of trees that provides enough shade to protect against a quick snow melt (unlike larch or other deciduous trees at high elevations). These trees are also associated with the mycorrhizal “snowbankers” such as certain species of *Hygrophorus* and *Cortinarius*, and they provide woody substrates for the saprobic species as well.

This taxonomically diverse group was first reported as an ecological assemblage by Wm Bridge Cooke in a 1944 article (Cooke 1944) on the fungi of Mount Shasta, California. This was followed by *Subalpine Fungi and Snowbanks* (Cooke 1955) in which he related the details of the macrofungi consistently fruiting near snowbanks in spring. The names of the fungi he reported are out of date (but recognizable). This set of fungi was subsequently called the “snowbank flora” by Alex Smith in *A Field Guide to Western Mushrooms* (1975). He reported particular species near snowbanks in Idaho where he spent summers, but did not treat the group as a whole in an article. In 1965 Orson K. Miller, Jr., contributed the brief but informative *Snowbank Mushrooms in the Three Sisters Wilderness Area* (Miller 1965). Both Smith and Miller described several new species of “snowbank mushrooms” and linked additional taxa to western snowbanks in a number of publications (references at end). Ammirati and Moser joined in to help delineate snowbank *Cortinarius* taxa, an ongoing process. More recent literature has updated the nomenclature (Bessette et al. 1995, Miller & Miller 2006, Redhead et al. 2000).

Moser described the snowbank fungi as a uniquely North American phenomenon (2004). This insight brings with it the realization that the “snowbank fungi” are dependent on a particular habitat limited to forest-covered mountain slopes with special climatic, geographic, and biological components. These restricted ranges are directly (habitat reduction, forest thinning, fire) and indirectly (global climate change) impacted by human activities.

Snowbank Species

The snowbank fungi are a taxonomically and ecologically diverse group of fleshy fungi that include both Basidiomycota and Ascomycota adapted to the unique microclimate provided by remnant snows in high-elevation conifer forests. *Hygrophorus* and *Cortinarius* species are mycorrhizal genera and have a mutually beneficial relationship with conifer trees. Other fungi are saprobic and decompose logs, twigs, cones, and organic debris, except for *Caloscypha fulgens* which is a seed pathogen.

All snowbank species of *Hygrophorus* are endemic to North America, with the exception of *H. marzuolus*, which is reported from Europe in spring but not necessarily with snowbanks (Moser 1955). *Hygrophorus* species can initiate fruiting in the subnivean

zone, and *H. goetzii* has been observed under 7–10 cm of solid ice where snow has melted and refrozen (Miller 1965). *Hygrophorus goetzii* has a small viscid pinkish-cream fruiting body (Hesler and Smith 1963, Miller 1965, 1967). *Hygrophorus marzuolus* (Fr.) Bres. and *H. caeruleus* O.K. Mill. have large, fleshy bluish-gray sporocarps, but only the latter has a strong smell of rancid meal (Miller 1984, Bessette et al. 1995). *Hygrophorus subalpinus* A.H. Sm. is a robust pure white mushroom with a gelatinous veil at first, and is sold in markets as an edible in the Pacific Northwest. *Neohygrophorus angelesianus* (A.H. Sm. & Hesler) Singer combines the macro-features of *Hygrophorus* and *Clitocybe*, and produces small brownish-gray mushrooms with drab purple brown tints and decurrent gills; the red reaction of fresh gill and stem tissue to KOH is distinctive (Smith and Hesler 1942, Miller 1965, 1967, Bessette et al. 1995).

Several species of *Cortinarius* are associated with snowbanks (Miller 1965), and others occur later in the spring grading into the typical spring mushroom flora. *Cortinarius ahsii* McKnight first described by McKnight is a nondescript brown mushroom with a bright yellow veil named for Alexander H. Smith (his initials: A.H.S.); it is likely synonymous with *C. zinziberatus* (Fr.) Fr. of Europe, which is not reported with snowbanks according to Moser. While this species became a well known “snowbanker,” it is often not the most common snowbank *Cortinarius* species. Subsequent study by Ammirati, Moser, and Miller revealed at least two other look-alikes that fruit at the same time which can be sorted out with the help of a UV light. This includes “*C. flavobasalis*” which fluoresces orange at the base (fresh young fruiting bodies!) and “*C. flavoroseus*” with a veil and flesh (cut it open) that fluoresce bright yellow. The latter two species have provisional names, and they are currently under study for publication. Ammirati states that a number of the snowbank *Cortinarius* subgen. *Telemonia* are not named, and Moser notes that particular *Cortinarius* species from the subgenus *Phlegmacium* can also be present. Out of four new taxa of the genus *Cortinarius* dealt with by Moser (2002), at least one (*Cortinarius auchmerus* M.M.Moser) might be associated with snowbanks. Occasionally particular *Entoloma* species are reported next to snowbanks in spring.

Two of the most common snowbank fungi, *Clitocybe glacialis* Redhead, Ammirati, Norvell & M.T. Seidl (= *Lyophyllum montanum* A.H. Sm.) and *C. albirhiza*, are considered decomposers. *Clitocybe glacialis* is recognized by its overall silvery gray color which glistens in sunlight reflected off snow (Smith 1957, 1975; Miller 1967). *Clitocybe albirhiza* H.E. Bigelow & A.H. Sm. is a related rather nondescript pale brown mushroom of the same size that can be recognized by the copious white subterranean rhizoids at its base (Bigelow and Smith 1962). Mushrooms of both emerge from the subnivean zone and persist after the snow has melted, likely due to slow decomposition in a cool climate. Interestingly, as they decompose, the two species become difficult to distinguish as both become a watery yellow-brown.

Mycena overholtsii A.H. Sm. & Solheim fruits in clusters on decorticated logs buried in the snow (Smith 1979). As snow recedes around the log, the mushrooms mature in moist snow chambers. The long, hirsute stipe is often buried in deep cracks in the woody substrate. It is recognized by its rather large size for a *Mycena*, a gray-brown striate bell-shaped cap, and substantial mycelium on the lower part of the stem. Hence the common name “fuzzy foot.” Other early species of *Mycena* are typically much smaller. *Lentinellus montanus* O.K. Mill. is another agaric found on logs near snow, but here the brown shell-shaped caps lack a stem. *Melanoleuca angelisiana* A.H. Sm. is characterized by a gray-brown pileus, contrasting white gills, and a dark stipe (Smith 1944, Bessette et al. 1995). It fruits on the ground near

snowbanks and in other habitats as well. *Melanoleuca* species have a white spore print and amyloid ornamented spores (somewhat similar to those of *Russula*). Macroscopically they often have a “twisted-striate” stipe.

Two western *Stobilurus* species fruit in early spring near snowbanks, *S. albipilata* (Peck) Wells & Kempton and *S. occidentalis* Wells & Kempton, and they are delineated on microscopic characteristics (Redhead et al. 1980). Both are tiny collybioid mushrooms, and it is helpful to follow their long stems down to buried cones for confirmation of identification. Although not strict “snowbankers,” they do occur at the same time and in the same habitats. All of the species in the preceding five genera (*Clitocybe*, *Mycena*, *Lentinellus*, *Melanoleuca*, and *Stobilurus*) have white spores and are North American species.

Nivatogastrium nubigenum (Harkn.) Singer & A.H. Sm. is a unique gastroid fungus related to the genus *Pholiota* (Singer and Smith 1959, Miller 1965). The cap never opens to release the spores, and this is hypothesized to be an adaptation to extreme cold and drought. Cooke (1955) reported that squirrels eat the fruiting bodies and disseminate the spores, and he described specimens set out on stones and branches to dry for later use. The caps are often buried in snow and are revealed only at maturity. There are no other secotioid fungi known on wood, and this species is restricted to North America. I have collected it near McCall, Idaho, on logs in the spruce-fir zone, and Cooke collected it on Mount Shasta in California. Interestingly, *Nivatogastrium baylisianum* E. Horak has been reported from alpine areas in New Zealand (Horak 1971).

Non-gilled Basidiomycota include several wood decomposers in the polypore and jelly fungus groups. There is some evidence that the hyphal growth of *Tyromyces leucospongia* (Cooke & Harkn.) Bondartsev & Singer (white sponge polypore) is maximized at 12 to 16°C, and that it can complete its life cycle below 7°C (Bessette et al. 1995). It is recognized as a white, soft marshmallow-like polypore with angular pores found on downed logs at snow melt. Many of the snowbank fungi do not grow well in culture and have therefore not been shown to be psychrophilic. The bright orange soft polypore with ragged teeth found in the same habitat is *Pycnoporellus abloluteus* (Ellis & Everh.) Kotl. & Pouzar (orange sponge polypore). *Guepinopsis alpina* (Tracy & Earle) Brasf. (lemon drops) is a gelatinous basidiomycete, and some jelly fungi are able to sporulate after being frozen while fully hydrated (Ingold 1982), an adaptation well suited to cold climates. Miller (1981) cites this as the most prolific species during snow melt in the western mountains, and we have shown it prefers cold temperatures for fruiting (Cripps, unpublished).

Numerous ascomycetes are associated with snowbanks, and several are reported here, although more certainly exist and particularly where melting snowbanks are combined with burned ground. *Caloscypha fulgens* (Pers.) Boud., an orange cup fungus with a bluish exterior (especially when handled), also occurs in Europe. It is a seed pathogen on spruce (*Picea*) and kills dormant seeds during stratification (cold treatment) in cool, moist soils (Paden et al. 1978). *Sarcosoma mexicanum* (Ellis & Holw.) Paden & Tylutki is a black cup fungus with a swollen gelatin-filled base (Tylutki 1979) that functions as a moisture reserve during spore maturation. It often fruits with the snowbank flora but is not a strict snowbank associate. I have observed it in Oregon, Idaho, and New Mexico, and it is reported from western Montana. *Plectania nannfeldtii* Korf fruits in the subnivean zone, and the black stalked cups emerge as snow melts in pockets around them (Miller 1965, 1967; Seaver and Shope 1930; Tylutki 1979). The rubbery ascocarps are remarkably durable and endure long after the snows are gone. It

cont. on page 6

Snowbank Mushrooms, cont. from page 5

was first described by Swedish mycologist Nannfeldt on a visit to Colorado in the early 1900s (Evenson 1997).

A set of Myxomycetes (slime molds) are also known to occur near snow. They are more commonly called the “nivicolous” myxomycetes and they are protists not fungi. They have been called the snowbank slime molds, but “snowbank” is defined in a broader sense for these organisms to include subalpine snowbanks and also alpine snow beds. Habitats include proximity to snow in alpine, arctic, and high-elevation habitats around the world and in the eastern USA. For photos see link on myxo-specialist Steve Stephenson’s website <http://www.myxowb.com/snow.htm>.

When collecting “snowbank fungi,” it is important to record the particulars of habitat and location since this specialized niche is easily overlooked in forest management. If snowbank fungi truly are restricted to the western US and require certain biotic and abiotic conditions, only those who recognize them can provide information on their distribution and identify potential threats. They are worth getting to know for their ecology and their uniqueness, as well as for their beauty.

Acknowledgements

This paper is dedicated to the memory of Orson K. Miller, Jr., a mycologist and wonderful mentor who introduced me to the snowbank fungi by in 1985 when our mycology class at the Flathead Lake Biological Station collected snowbank fungi on the steep slopes to Jewel Basin in western Montana. I had collected them in Colorado for ten years previously, but their import had somehow escaped me. I would like to thank Joe Ammirati and Egon Horak for their comments to the first draft of this article.

*Snowbank-associated fungi in the western USA,
Ecology of Taxa*

BASIDIOMYCOTA	
Gilled Mushrooms (dark or pink spores)	
<i>Cortinarius ahsii</i> McKnight	Mycorrhizal with conifers
<i>Cortinarius auchmerus</i> Moser	Mycorrhizal with conifers
<i>Cortinarius clandestinus</i> Kauffman	Mycorrhizal with conifers
<i>Cortinarius croceus</i> (Schaeff.) Gray	Mycorrhizal with conifers
<i>Cortinarius “flavobasalis”</i> McKnight & Moser nom. prov.	Mycorrhizal with conifers
<i>Cortinarius “flavoroseus”</i> nom. prov.	Mycorrhizal with conifers
<i>Cortinarius subalpinus</i> nom. prov.	Mycorrhizal with conifers
<i>Cortinarius (Phlegmacium)</i> spp.	Mycorrhizal with conifers
<i>Entoloma</i> sp.	Terrestrial
<i>Nivatogastrium nubigenum</i> (Harkn.) Sing & A. H. Smith	On wood
Gilled Mushrooms (white spores)	
<i>Clitocybe albirhiza</i> Bigelow & A. H. Smith	Terrestrial decomposer
<i>Clitocybe glacialis</i> Redhead et al.	Terrestrial decomposer
<i>Hygrophorus goetzii</i> Hesler & A. H. Smith	Mycorrhizal with conifers?
<i>Hygrophorus marzuolus</i> (Fr.) Bres.	Mycorrhizal with conifers
<i>Hygrophorus subalpinus</i> A. H. Smith	Mycorrhizal with conifers

<i>Lentinellus montanus</i> O.K. Miller	Wood decomposer
<i>Melanoleuca angelesiana</i> A. H. Smith	Unknown
<i>Mycena overholtsii</i> A. H. Smith & Solheim	Wood decomposer
<i>Neohygrophorus angelesianus</i> (A. H. Smith & Hesler) Singer	Unknown
<i>Strobilurus albopilatus</i> (Peck) Wells & Kempton	Conifer cone decomposer
<i>Strobilurus occidentalis</i> Wells & Kempton	Conifer cone decomposer
Non-gilled	
<i>Pyncnoporellus alboluteus</i> (Ellis & Everh.) Kotl. & Pouzar	Wood decomposer
<i>Tyromyces leucospongius</i> (Cooke & Harkn.) Bondartsev & Singer	Wood decomposer
Jelly Fungi	
<i>Guepiniopsis alpina</i> (Tracy & Earle) Brasf.	Wood decomposer
ASCOMYCOTA	
<i>Caloscypha fulgens</i> (Pers.) Boud.	Seed pathogen on <i>Picea</i>
<i>Discina perlata</i> (Fr.) Fr.	Terrestrial decomposer
<i>Gelatinodiscus flavidus</i> Kanouse & A.H. Smith	On yellow cedar litter: <i>Callitropsis nootkatensis</i> (D. Don) Oerst.; syn.: <i>Chamaecyparis nootkatensis</i> (D. Don) Spach
<i>Gyromitra montana</i> Harmaja	Terrestrial decomposer?
<i>Sarcosoma latahense</i> Paden & Tylutki	Terrestrial decomposer?
<i>Sarcosoma mexicanum</i> (Ellis & Holw.) Paden & Tylutki	Mycorrhizal with spruce?
<i>Plectania nannfeldtii</i> Korf	Decomposer <i>Abies</i> , <i>Picea</i> litter

Literature Cited

Bessette, A.E., O.K. Miller Jr., A. Bessette, & H.H. Miller. 1995. *Mushrooms of North America in Color*. Syracuse Univ. Press, Syracuse NY. 172 pp.

Bigelow, H.E., A.H. Smith. 1962. *Clitocybe* species from the western United States. *Mycologia* 54: 498–515.

Cooke, Wm Bridge. 1944. Notes on the ecology of the fungi of Mount Shasta. *American Midland Naturalist* 31:237–249.

Cooke, Wm Bridge. 1955. Subalpine fungi and snowbanks. *Ecology* 36(1): 124–130.

Cripps, C.L. 1996. Snowbank mushrooms of the Rocky Mountains. International Symposium on Snow, Swiss Federal Institute for Snow and Avalanche Research, Davos, Switzerland, Nov. 21–24.

Evenson, V. 1997. *Mushrooms of Colorado*. Denver Botanic Gardens & Denver Museum of Natural History, Denver, CO.

Hesler, L.R. & A.H. Smith, 1963. *North American Species of Hygrophorus*. University of Tennessee Press, Knoxville, TN 416 pp.

Horak, E. 1971. Contributions to the knowledge of the Agaricales s.l. (fungi) of New

Zealand. *New Zealand Journal of Botany* 9: 463–493.

Ingold, C.T. 1982.
Resistance of certain basidiomycetes to freezing. *Trans. Br. Mycol. Soc.* 79: 554–556.

Miller, O.K., Jr. 1965.
Three new species of lignicolous agarics in the Tricholomataceae. *Mycologia* 57: 933–945.

Miller, O.K., Jr. 1965.
Snowbank Mushrooms in the Three Sisters Wilderness Area. *Mazama* 47: 38–41.

Miller, O.K., Jr. 1967.
Notes on Western Fungi. I. *Mycologia* 59: 504–512.

Miller, O.K., J.R. 1981.
Mushrooms of North America. Chanticleer Press, E.P. Dutton, New York. 368 pp.

Miller, O.K., Jr. 1984.
A new species of *Hygrophorus* from North America. *Mycologia* 76: 816–819.

Miller, O.K. Jr. & H.H. Miller 2006.
North American Mushrooms. Pequot Press (a Falcon Guide), Helena, MT.

Moser, M. 1955.
Hygrophoraceae. pp. 36–46. In *Kleine Kryptogamen-flora*, Band II b.

Moser, M. 2002.
Studies in the North American Cortinariid VII. New and interesting species of *Cortinarius* subgen. *Telamonia* (Agaricales, Basidiomycotina) from the Rocky Mountains. *Feddes Repertorium* 113: 48–62.

Moser, M. 2004.
Subalpine conifer forests in the Alps, the Altai, and the Rocky Mountains: a comparison of their fungal populations. pp. 151–158. In: Cripps, ed., *Fungi in Forest Ecosystems: systematics, diversity and ecology*. New York Botanical Garden Press, Bronx, NY.

Paden, J.W., J.R. Sutherland, & T.A.D. Woods 1978.
Caloscypha (Ascomycetidae, Pezizales): the perfect state of the conifer seed pathogen *Geniculodendron pyriforme* (Deuteromycotina, hyphomycetes). *Can. J. Bot.* 56:1978.

Redhead, S.A. 1980.
The genus *Strobilurus* (Agaricales) in Canada with notes on extralimital species. *Can. J. Bot.* 58:68–83.

Redhead, S.A., J. Ammirati, L. Norvell, & M. Seidl 2000.
Notes on Western North American snowbank fungi. *Mycotaxon* 76: 321–328.

Singer, R. & A. H. Smith, 1959.
Studies on Secotiaceous Fungi. V: *Nivatogastrium* Gen. Nov. *Brittonia* 11: 224–228.

Smith, A.H. 1944.
New North American Agarics. *Mycologia* 36: 242–262.

Smith, A.H. 1957.
Additional new or unusual North American agarics. *Sydow. Ann. Mycol.* Ser II., Beiheft 1: 46–61.

Smith, A.H. 1975.
A Field Guide to Western Mushrooms. The University of Michigan Press, Ann Arbor. 280 pp.

Smith, A.H. & L.R. Hesler 1942.
Studies in North American Species of *Hygrophorus* - II. *Lloydia* 5(1): 6.

Smith, A.H., H.V. Smith, & N.S. Weber 1979.
How to Know the Gilled Mushrooms. Wm. C. Brown Co, Dubuque, Iowa. 334 pp.

Smith, A.H. and W.G. Solheim 1953.
New and unusual fleshy fungi from Wyoming. *Madrono* 11(4): 103–109.

Tylutki, E.E. 1979.
Mushrooms of Idaho and the Pacific Northwest: Discomycetes. The

University Press of Idaho, Moscow, ID. 133 pp.

Postscript:

Snow Mushrooms

Just for fun, check out this article which describes mushrooms actually made out of snow!

Cornish, V. 1902.

On snow-waves and snow-drifts of Canada. *The Geographical Journal* 20:137–173.

WILD MUSHROOMS LESS PRECARIOUS THAN FEARED

Glen Martin

adapted from *The Spore Print*, L.A. Myco. Soc., April 2007

Fears that wild mushrooms could disappear from Pacific state woodlands are easing because of growing production in other countries and research that shows harvesting may not endanger most native fungi as much as once feared.

Foreign Competition

Until recently, hordes of professional mushroom pickers would descend on forests each fall and spring to harvest matsutake, morel, chanterelle and porcini mushrooms to sate the skyrocketing domestic and international demand. Worries grew that the harvest was not sustainable.

But in the past few years, the wild mushroom trade has expanded to Latin America and Asia. Mushrooms are plentiful there, and labor costs are exponentially lower. Other infrastructure improvements—such as better roads—ensure the mushrooms can make it to market before spoiling, experts say.

Paul Stamets, proprietor of Fungi Perfecti, said prices for all commercial species have fallen. “Pickers used to get \$30 a pound for matsutake, and now it’s just a fraction of that,” he said. “There aren’t nearly as many buying stations around. The trade has largely moved elsewhere.”

Resilience to Picking

Stamets said harvesting has had little effect on mushroom abundance in the United States, though intensive picking can have a depressive effect in certain locales. A greater long-term threat, Stamets said, is habitat destruction: suburban sprawl, road construction, and some logging. As woodlands disappear, so do the mushrooms that depend on them.

Research supports Stamets’ belief that mushrooms may be more tolerant of regular harvesting than previously thought. David Pilz, an Oregon mycologist who spent 14 years documenting harvest impacts, said picking most types of mushrooms is analogous to plucking apples from a tree. That’s because, like a tree, the subterranean mycelium that produces mushrooms is a long-lived organism that can produce fruit year after year as long as it isn’t damaged.

Still, the potential human impact on wild mushrooms varies from species to species.

Morels—the prime spring species—seem fairly immune to harvesting, even though the pressure can be intense. The year after a big forest fire, mushroom hunters typically swarm burn zones. However, morels are among the planet’s “weediest” mushrooms, Pilz said. No matter how many are harvested, enough release their spores to generally assure their abundance in following years. “The fact that they grow in burned areas also helps them,” he said. “In heavily wooded areas, spores can disperse only a few feet. But in burned zones, spores fall on bare earth and are transported long distances by wind and water.”

cont. on page 8

Wild Mushrooms, cont. from page 7

Likewise, chanterelles, a prized fall variety, generally stand up well to harvesting. That's because they ripen over several weeks, distributing their spores a few at a time, he said. In any chanterelle zone, some mushrooms are always dropping spores.

But two of the most valuable fungi—matsutake and truffles—can be severely harmed by harvesters, Pilz said. That's because the mycelia that produce them do not fruit above ground. Truffles are wholly subterranean, and prime matsutakes barely poke through the dirt. In North America, harvesters find them by raking likely spots, damaging the mycelial mats.

"The damage can be significant," said Pilz. "We're trying to encourage the use of trained dogs to sniff out matsutake and truffles, as is done in Europe. That way they can be found and harvested with little or no damage."

MOREL MUSHROOM AND OLOROSO SHERRY GRATIN

Sunset Magazine, June 2004

Notes: At the wine bar, this dish is served in a small *cazuela* (a Spanish earthenware casserole); we increased the portion to make a generous appetizer for four. If you can't find morels, cremini mushrooms will make a different but delicious dish. And if you can't find Manchego cheese, you can use another sharp-flavored, aged white cheese, such as dry jack.



- 8 oz. Fresh morel or cremini mushrooms (see notes)
- 3 TBs Butter
- ½ C Minced shallots (about 2 oz.)
- 2 TBs Minced garlic
- ½ C Oloroso sherry

- 1 C Whipping cream
- 1 C Finely shredded Manchego cheese
(about 2 oz.; see notes)
- 8 oz. Crusty artisan-style bread, sliced and toasted

1. Trim and discard discolored stem ends from morels. Submerge mushrooms in a bowl of cool water and gently agitate with your hands to loosen any dirt. Drain, rinse under running water, and gently pat dry. Cut mushrooms in half lengthwise (if using cremini mushrooms, cut into quarters).

2. In a 10- to 12-inch frying pan over medium heat, melt butter. Add shallots and garlic and stir often until limp, about 5 minutes. Add mushrooms and stir often until juices released by mushrooms have evaporated, 5 to 6 minutes.

3. Add sherry and increase heat to medium-high. Boil until sherry is reduced by about half, about 3 minutes. Add cream and boil, stirring occasionally, until sauce thickly coats mushrooms and is reduced by about two-thirds, 4 to 5 minutes.

4. Spoon mushroom mixture into a shallow 3- to 4-cup ceramic baking dish. Sprinkle top evenly with cheese. Broil 4 to 6 inches from heat until cheese is melted and bubbling, about 2 minutes. Serve with toasted bread slices.

Yield: Makes 4 appetizer servings.

Nutrition per serving: *Calories* 511 (60% from fat); *Fat* 34 g (sat. 21 g); *Protein* 12 g; *Cholesterol* 105 mg; *Sodium* 532 mg; *Fiber* 2.7 g; *Carbohydrate* 40 g

SICK CALL

This spring has not been kind to at least three PSMS members: **Don Lennebacker** had a pacemaker installed after a heart attack on Easter, **Russ Kurtz** suffered a broken pelvis, and **Marilyn Droeg** is recuperating from a knee replacement. Please drop them a card to wish them well and let them know you're thinking of them.



Puget Sound Mycological Society
Center for Urban Horticulture
Box 354115, University of Washington
Seattle, Washington 98195

RETURN SERVICE REQUESTED

Non-Profit Org.
U.S. POSTAGE
PAID
SEATTLE, WA
PERMIT NO. 6545