



Ohio Mushroom Society

The Mushroom Log

Invasive Species, Extinctions and Other Cheery Topics to Get You Through the Winter Blahs

By Dave Miller

Ed. Note: This is a continuation of an article begun in the Jan/Feb Log. There I gave a brief overview of two fungal-caused tree diseases, Chestnut Blight and Dutch Elm Disease and began discussing the Sudden Oak Death disease (SOD).

First noted in the mid-1990's, SOD appeared in northern California woodlands. It has now spread to 13 counties in California and one in Oregon and has killed hundreds of thousands of oaks.

In 2004, SOD was discovered in several wholesale nurseries in southern California. These nurseries shipped potentially infected plants to retail nurseries in every U.S. state, raising the concern that our eastern oak forests might be at risk. The nurseries which

received possibly infected stock have been inspected. So far, *Phytophthora ramorum*-infected plants have been found in 139 facilities in 18 states, including FL, GA, LA, OR, VA and WA. Infected plants and adjacent nursery stock have been destroyed and plans are underfoot to survey forest environments around these nurseries to see if *P. ramorum* has spread to the forest. Scientists are working to try and determine whether *P. ramorum* is, like Chestnut blight and Dutch Elm disease, an introduced invasive or a mutant form which arose spontaneously. A word about parasites: when one moves into a new habitat, it can attack new hosts, in a process scientists call the trans-species jump. This is what is believed to have happened with the human immunodeficiency virus. HIV appears to have once lived in chimps, without making them sick. HIV made trans-species jumps and became a virulent virus in humans.

It's not a good idea for a parasite to quickly kill off its host. The longer a host lives while a parasite is feeding on it, the more chance for the parasite to reproduce. With time, after the parasite encounters a host with no resistance, the host usually develops some resistance, which increases with time as

natural selection operates. Another way to put it is that the non-resistant hosts die off before they have a chance to reproduce, leaving those behind with some limited, but increasing resistance.

When we say "with time", how much time are we talking about here? Since generation times for trees are measured in decades, it will take a good long time for natural selection to rescue us.

Lest you get the wrong impression that fungi are the only bad guys in this scenario, I hasten to add insects to the growing list of invasive species. Especially prevalent among this group are the beetles. There are over 350,000 known species of beetles, or coeloptera, as the scientists call them, more than any other order in the animal kingdom. When a clergyman, while visiting the British biologist J. B. S. Haldane's laboratory, asked him what his studies told him about the nature of God, Haldane reportedly replied, "God has an inordinate fondness for beetles." No argument from me on that one!

We've already heard about the elm bark beetle causing the rapid spread of Dutch elm disease. In May and June of 2002, adults of another beetle, later identified as the emerald

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ash borer (EAB), were collected from ash trees in the Detroit area. They were soon discovered in neighboring Ontario, Canada. They are native to northeastern China and neighboring Korea, Mongolia, far-eastern Russia, and Japan. No one knows how they arrived in Detroit (probably in 1997) but infested crating or pallets from Asia are suspected.

Exotic insects are so destructive in part because their hosts lack resistance and also because they have escaped the predators from their native land.

Newly hatched larvae burrow under the ash bark, feeding on the tree's phloem and cambium, and emerge as adults in 1-2 years. Adults, which chomp harmlessly on ash leaves, can fly 25 to 38 feet in short bursts but long distance flights of more than ½ mile are possible, before they lay their eggs on ash bark. Humans are responsible for much more effective dissemination of the beetles. By February, 2003 beetles were found in the Toledo area. It was found in northern Indiana in 2004, Northern Illinois in 2006 and western Pennsylvania in 2007. One means of control involves cutting and burning the infested trees. Ash splits easily and is favored as firewood (it also is the wood used in baseball bats). Firewood infested with beetle larvae was trucked east and south of Toledo so that this beetle is now found in 26 other Ohio counties east and south of Lucas Co., where it first appeared.

Since its discovery, EAB has killed more than 20 million ash trees in MI, OH, and IN, most of these in southeastern MI. It has cost municipalities, property

owners, nursery operators, and the forest products industry millions of dollars. You can find out more at the <http://www.emeraldashborer.info/> website. Efforts are underway to find natural predators of the EAB, but this will take time as we need to determine that such potential control agents will not also go after beneficial Ohio insects.

Another introduced invasive is the wooly adelgid, a type of aphid. First discovered in and near a Japanese garden in VA, it has spread to cover nearly the whole range of eastern hemlock, *Tsuga canadensis*. Recently it has appeared in OH, MI, VE, NH, and ME, close to the northern limits of the hemlock's range. The adelgid sucks the juices out of hemlock needles, which yellow and die. Being good insects, their reproductive rate allows them to quickly defoliate even large trees. It also kills saplings before they can reproduce. Some scientists believe eastern hemlocks could disappear from the wild, a condition known as "functional extinction."

By now, I think you get the idea: our forests are threatened by a menagerie of fungal and insect pests. Perhaps we can look forward to the day when our native hardwoods will be replaced by "weedy" trees like the so-called tree-of-heaven, *Ailanthes*. I can recall this tree, from my youth, as being the only one which could seemingly flourish in the more polluted, blighted areas of Chicago.

What is to be done? Find out in the May/June Log.

What Lies Beneath: A New

Mushroom

Hydrologist happens onto a novel gilled species that seems to thrive underwater in the upper Rogue River

Ed. Note: Now we'll have an excuse to go wading on hot summer forays!

By Paul Fattig
Mail Tribune
November 20, 2007 6:00 AM

SHADY COVE — Hydrologist Robert Coffan knew he was looking at something very unusual in the knee-deep summer waters of the upper Rogue River.

Here were gilled mushrooms, swaying in the main current of the clear, cold river in early July through late September.

"But since gilled mushrooms DO NOT live and grow underwater, I was real nervous" about approaching a mycological expert, admitted the adjunct professor at Southern Oregon University.

Indeed, Darlene Southworth, a retired SOU biology professor, was plenty skeptical when he broached the subject. Although she was impressed by underwater photographs taken by Coffan, she wanted to see the evidence firsthand.

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Not only did she witness the mushrooms found by Coffan, but she discovered others during an August visit to a stretch of the north fork of the river within a few miles of Woodruff Bridge in the Rogue River-Siskiyou National Forest.

"There are no known gilled mushrooms living underwater," Southworth explained. "And this is not a slime mold or anything like that. These are regular gilled mushrooms.



A new species of mushroom, dubbed *Psathyrella aquatica*, has been found in the upper Rogue River. Biologists believe this is the first species of gilled mushroom to be found living underwater in the world. The bubbles on top of the mushroom are of an unknown gas. Photo courtesy of Robert Coffan.

"We believe this is a new species," she concluded of the mushrooms that are typically about 10 centimeters tall with caps that are about 2 centimeters wide.

The find was unveiled Monday night at the November meeting of the Upper Rogue Watershed Association, for whom Coffan had prepared a water assessment last year.



The mushroom is being introduced to the broader scientific community in a 14-page paper submitted Nov. 9 to the science journal *Mycologia*. The paper was written by Coffan in collaboration with Southworth and Jonathan Frank, a laboratory technician at SOU.

Coffan credits Southworth, who now conducts research under a National Science Foundation grant at the university, for focusing on mycorrhizal fungi, and Frank for the paper and much of the research in determining the mushroom's uniqueness.

Up at Oregon State University, Matt Trappe, a doctoral candidate in forest mycology, says Coffan has found a unique mushroom. He and his father, Jim Trappe, a retired U.S.

Forest Service mycologist who now teaches in OSU's botany and plant pathology department, were consulted on the find.

"As far as we've determined, this is a first in Oregon as well as a first in the world," Matt Trappe said of gilled mushrooms living in water. "We're not aware of anything at all like this in mycology where the reproductive mushroom structure appears to be perennially underwater.

"If this evolved in Oregon, what are the odds it can be found in streams and rivers around the world?" he asked. "This raises all kinds of questions about spore dispersal and evolution."

There are more questions than answers at this point, acknowledged Coffan, who originally discovered the water-dwelling gilled mushrooms in summer 2005. None of the mushrooms were found in slack water, he noted.

A DNA analysis at SOU's Bio Tech Center and a cross-check of references and experts, including mycologists at the University of Minnesota, determined the mushrooms belonged to the genus *Psathyrella*, Southworth said. Samples were sent to OSU and to San Francisco State University.

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There are about 600 known species of *Psathyrella*, all terrestrial, she said.

"How do we identify them? We look at the morphology — the form, the shape and the DNA," she said.

It has a small bell-shaped cap, a thin stipe (stem) and gills underneath, she said. They examined the cells in the cap and made a spore print.

Researchers have ruled out the possibility the mushrooms were growing along the banks and were merely submerged by rising waters brought on by snowmelt.

The mushrooms were found in the spring-fed "base" flow of the river, Coffan said, noting that flow is consistent and keeps the mushrooms submerged.

The mushrooms tend to grow on submerged wood but can also be found growing in the gravel, Southworth said.

"These are growing in the same place for three months," she said, adding they have been found as late as Sept. 21.

Although there are some known freshwater aquatic fungi, this is the only known gilled mushroom that grows underwater, she reiterated.

"We noticed there is a gas bubble underwater," she said. "When we pulled the mushroom out, we could hold it up for some seconds before the bubbles burst. But they would not be uniformly distributed. They would stick to the cap, to the stipe, to Jonathan's fingers."

They don't know what the gas is, she noted.

They are also intrigued by its three-month fruiting season. "That's way long for mushrooms," she observed.

As for their edibility, Southworth figures the waterborne mushrooms are too small to warrant collecting for food. However, several of the terrestrial *Psathyrella* are edible, although most have never been tested as a food source, according to her research.

"There is no reason it would go toxic," she observed of a member of the genus growing in water.

Meanwhile, Coffan, Southworth and Frank plan to return to the area to conduct further research to try to determine the extent of the mushroom's habitat. They also want to check out other streams in the region for evidence of the mushrooms.

"But it will be next summer before that is feasible," she

said. "Right now we can describe this one river: It's aerated, cold, clear, steady flow. But we want to find out how the spores are dispersed."

"And we want to find out how unique the habitat is," Coffan said. "We have a whole new area to look for mushrooms now. It's mind-boggling."

Reach reporter Paul Fattig at 776-4496 or e-mail him: pfattig@mailtribune.com.

Distant Harvests

(Roots, Shoots, and Leaves)

By Susan Goldhor

Reprinted with the author's permission from the 2007 Issue No. 3 of the Boston Mycological Club.

Humans are inordinately fond of pinpointing a single entity and giving it some sort of title. This must be so ingrained in our DNA that no one would watch a show that replaced the Academy Awards or the Oscars with a prize for a whole bunch of terrific movies. Every four years we watch some of the world's best athletes indulge in an orgy of self-hate because they didn't win the gold medal. (When the silver medalist weeps in furious misery, I want to

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break his or her knee caps.) And it's not just the best-seller lists, awarding top billing to the latest block-buster formula airport book; even in the world of science, for years we had a Citation Index (we probably still have it, but I've stopped following it) that ranked papers by how many times they were cited in other papers. The winner was the paper that was mentioned more times than any others. It didn't matter if it was mentioned because it was wrong (I bet that Cold Fusion got a *lot* of citations for a while); or because it's common practice to crib citations from prior papers, without actually reading what's cited; it was the numbers and the idea that there was a winner that provided the hook. So it's not surprising that every now and again, editorial boards or symposium designers come up with the hook of looking at the part of the world we know least about.

For a long time, this was outer space. Then someone noticed that there were a lot of spaces closer to home that we knew almost nothing about. (Okay, it's sort of a booby prize. Bottom billing. But it still gives it that magical Number One.) The deep sea probably got star billing first. And, since we could have been more accurately named *Homo narcissans*, the human brain always gets big play here. Recently though, two

ecosystems have been pushing their way into the top spots on our ignorance list. Since I'm human, I'm sitting here, trying to decide which deserves the number one spot. As the sole voter, I think I'm going to award this to the underground. Not the deep underground of interest to large corporations in the extraction game, or the gorgeous underground that spelunkers explore, but just the first few feet of soil, full of roots and mycorrhizae, bacteria and arthropods, duff and worms and a few small mammals. In short, the Rhizosphere. I'll give the number two spot to the Canopy. In other words, as we walk through the woods we think we know so well, the two least understood ecosystems in the world are under our feet and above our heads. (Cornell University ecologist David W. Wolfe has coined the term "surface chauvinism", to explain this situation)

What's amazing about our ignorance is its profundity. We really know almost nothing. For example, roots. Roots are something we're all familiar with. How many roots does a tree have? How fast do roots grow? How stable are roots? Do roots (and leaves) pool resources, so that if some of them get water or sunlight, they all share in the booty? In our defense, it's difficult to study roots. Any treatment that cleans away all the soil from roots, probably cleans away the fine root hairs as well.

And counting root hairs (the little delicate rootlets that actually do the work) is much much harder than counting leaves; there are more of them, they are far smaller, and they have a much shorter life-span. (In case you don't believe that it's really that hard, researchers once grew a single grass plant - a type of root-rich rye - in the laboratory and carefully removed each particle of soil. This one plant contained an estimated fourteen *billion* individual root hairs comprising six thousand *miles* of rootlet. I rest my case.) And by the way, before I go any further, I want to announce in the interests of ethical disclosure that if I don't give a specific reference for any fact or quotation, I've taken it either from a wonderful and readable book called, "The Hidden Forest" by Jon. R. Luoma (1999), or from "Mycorrhizal Ecology", Volume 157 of Springer's series on Ecological Studies (2002).

To answer some of the above questions, Luoma visited two root research sites: one in northern Michigan and one in Wisconsin. In the former, scientists have constructed an underground tunnel, with picture windows opening onto the rhizosphere of the mixed hardwood forest above. The windows are shuttered when not in use, so that the lighting in the tunnel doesn't affect root growth. The Wisconsin researcher Mark Coleman

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has used 'minirhizotrons,' steel and Plexiglas tubes outfitted with magnifying video cameras, that he can lower directly into a small hole in the forest soil. Speeding through videotapes he had made from the rhizotrons, Coleman has been able to observe an extraordinary dance of fine roots that almost instantly appear and melt away rapidly in the soil.

"I thought I'd be able to watch a root extend itself through the soil, slowly, over time,' he says. 'But it's more like this: one day, there's nothing there. The next day, there's a root all the way across the screen. I see them for a day or two, and then it's like they've done their thing, and they're suddenly gone.' (The roots do not, of course, simply vanish. They are eaten by microbes and small arthropods, and thus cycle their rich nutrients back into the hidden underground ecosystem.) ... 'We've learned a few things,' he says. 'But what we still don't really understand is how a root is born, how it grows, and how it senesces [dies]. It makes you wonder if the Heisenberg uncertainty principle shouldn't have been applied to our work, rather than physics.'

Reading on in Luoma, I had known that different tree species had differently shaped root systems, just as each species' above-ground branching pattern is different. But what I hadn't known was that, at least in some trees, there seem to

be direct links between individual roots and individual leaves, with that root sending water and minerals to that leaf, and the leaf returning the favor by sending sugar to that root. (This work was done on small trees, by injecting radioisotopes, and tracking their path.)

The fleeting nature of root hairs raises questions about the life-times of mycorrhizal hyphae which, after all, live and die by their connections to roots. Presumably, they too must be able to reach out rapidly and cope with the loss of their partners. In 2003, the May 16 issue of *Science* contained an article entitled, "Rapid Turnover of Hyphae of Mycorrhizal Fungi Determined by AMS Microanalysis of ^{14}C ." The scientists in England who carried out this work used a clever experimental method, which took advantage of the fact that C^{14} in our current atmosphere contains ^{14}C (Carbon-14, a rare radioactive form [isotope] of carbon), but CO_2 generated from fossil fuel, contains almost none. The experimental plants were given fossil CO_2 for five hours. The researchers were able (by incredibly sensitive

microanalysis) to pick up the quantitative differences in C types in hyphae between the experimentals and the controls, and to follow this over time, which enabled them to see how rapidly C turned over. Their estimate of the life time of hyphae was about six days. However, they point out that this was under protected laboratory conditions and that in the field, hyphal turnover could be greater, due to the same pressures that affect roots; grazing by microbes and small arthropods, drought, etc.

Like almost all good science, these findings raise more questions. What makes roots grow? How do the hyphae find and access the roots? How much C does the plant allocate to below-ground roots and fungi? If both roots and hyphae cycle their C (or CO_2) back so quickly, does this go into the atmosphere or does it stay in the soil?

(To be cont'd next Log)

Fungus Threatens Cave Drawings

By Pierre Sauvey

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Reprinted from the Feb., 2008 Spore Print, the Journal of the Los Angeles Mycological Society

Bordeaux, France (AP)—New clusters of black fungus are spreading over famed cave drawings in southwest France, scientists warned.

But the scientists said they have found a bacteria-killing recipe to protect the remarkable Paleolithic paintings.

The new stains are the latest biological threat to the Lascaux cave drawings, which were discovered in 1940 and are considered one of the finest examples of prehistoric art.

Carbon-dating suggests the murals of bulls, felines and other images were created between 15,000 and 17,500 years ago in the caves near Montignac, in the Dordogne region.

In 1963, after green algae and other damage appeared, the caves were closed to the public. Only scientists and a few others are allowed to enter at certain times; a replica of the main Lascaux cavern was built nearby and has become a big tourist draw.

Even those measures have not stopped the appearance of the fungus-related stains.

This July, caretakers noticed new black spots covering some of the drawings. Samples taken from them showed the stains were caused by two fungi, *Ulocladium* and *Gliomastix*, that developed on top of a sublayer of existing bacteria.

Targeted biocides, which are substances that can kill bacteria, were tested on the samples. At a meeting this

week, the Lascaux Caves International Scientific Committee approved the use of the localized biocides to treat the affected cave areas.

Once that is done, the caves will be entirely closed for three months, said Michel Clement, the French Culture Ministry's top architectural and cultural heritage official.

The climate control system, which was installed in 2001 but has produced some moisture-related stains, will also be modified or replaced, the panel announced.

Just what is causing the new bacteria to appear remains unclear.

Some studies reviewed by the scientific panel suggest that global warming may be to blame.

The average natural temperatures inside the caves, measured by the climate control system, rose about 1.6 degrees F. since 1981, according to Marc Gauthier, president of the committee 20 Nov., 2007.

Time to Renew: OMS Dues for 2008 are Due

Well It's that time of year again. Spring is almost here and we will soon be hunting mushrooms. Don't forget to renew your 2008 dues if you haven't done so already. Don't miss a single issue of the Mushroom Log or miss out on upcoming foray opportunities. At a measly \$10 per year, it's still one of the best values around! The cutoff date for dues payment is March 31,

2008. You will be removed from the *OMS Mushroom Log* mailing list after the March/April issue, if we haven't received dues from you before the subsequent issue is to be mailed. Use the handy renewal form provided in this Log. And please, alert us of any name, address, zip code, email, and telephone number or area code changes.

NAMA dues are also due now. NAMA dues for OMS members are \$32. If you are a NAMA member, you no longer need to send the renewal check through OMS. You can send it directly to NAMA, just be sure you mention you are an OMS member in good standing. (They do a once a year verification of members with us.) The benefits of NAMA membership include:

1. Subscription to 6 issues of *The Mycophile*.
2. *Mcllvainea*.
3. Booklet listing NAMA's entire membership.

To sum up:

- OMS costs \$10 per year
- NAMA costs \$32 per year —for OMS members
- Separate checks, please
- Send OMS checks to Jerry Pepera, P. O. Box 1075, Chardon, OH 44024.
- Send NAMA check to: Ann Bornstein, 336 Lenox Ave., Oakland CA 94610-4675.

We welcome your ongoing participation!

Articles for the next newsletter

Deadline —May. 26

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Calendar of Events

OMS Events

Email Jerry at g_pepera@sbcglobal.net to receive notification of impromptu events. Check your most recent issue of the *Mushroom Log* for event updates and for more detailed information. Please plan to join us. All mini-and morel forays are subject to cancellation. Call first to confirm. Please bring a whistle and compass and RSVP the host so they have cancellation flexibility.

May 3 (Sat.) Morel miniforay at Calcutta at the McDonalds next to the Ogilve Plaza. Directions: Exit OH Rte 11 onto OH Rte 170. Go north for ca. 1-1.5 mi. McDonald's is of left and meeting area is Ogilve parking lot just before McDonalds. Meet 9am, leave 9:30 am. Must RSVP Sharon Greenberg 330/457-2345. Leave her your phone #, so she can contact you if it's canceled (no morels!)

May Date tba (Sat, 9am)— Morel Hunt at Mt. Gilead State Park
Directions: From I-71 take exit 151 onto OH-95 toward Mt, Gilead. Drive 6.5 mi west to Mt. Gilead S.P. We will meet at the last parking lot to the left of the park office. We will eat lunch in Mt. Gilead, and if anyone wants to do more hunting, we may explore Alum Creek State Park in the afternoon.
Contact Hugh Urban for more info: (614) 447-0706 or urban.41@osu.edu (Hugh Urban, host)



Other impromptu mini forays, as follows:

An open invitation to anyone who wants to mushroom hunt in Fredericktown. Call Dick Grimm (740) 694-0782, and if he's available and there are mushrooms in the woods, he will go.

Sat. July 12th, 9 AM. Mt Gilead State Park, Main Pavilion. A joint mini-foray with the NE Ohio Native Plant Society. Dick Grimm, (740) 694-0782 and Tom Sampliner (216) 371-4454.

Aug. or Sept. Mini-foray. Chance Creek, Lorain Co. Metroparks, depending on weather!
Dave Miller (440) 774-8143.

Oct. 5 (Sun.) Mini-Foray— Grove's Woods, Trumbull Co., Pete & Pauline Munk. (440) 236-9222.

Email Jerry as instructed above.

July 19-20(Sat-Sun.)— **Summer Foray** at Dawes Arboretum. Details tba.

Oct. 11-12 Fall Foray, Little Beaver Creek Nature Center at Beaver Creek State Park, near Calcutta OH. Details tba.

Sat. Nov.15th. Annual Dick Grimm Banquet. Buckeye Lake Yacht Club. Details tba.

Ohio & Regional

April 26-27(Sat.-Sun.)— Western PA Mushroom Club's (WPMC) Morel Madness, Mingo Creek. See their website at www.wpamushroomclub.org

July 31-Aug. 3 (Thurs.-Sun.) NEMF, Northeastern Mycological Foray, Connecticut College, New London CT. A See their website www.nemf.org for details.

Aug. 10th (S) Scenic Vista Park, Wayne Bridge Rd., just west of Lisbon, 2:00-4:00. Outdoor mushroom hike and mushroom display. Conducted by Walt Sturgeon. Free.

Sept. 13th (S) Beaver Creek State Park, at the Nature Center, 5 hour mushroom workshop, conducted by Walt Sturgeon. Registration and Fee, contact the Nature Center or Park Office.(330) 385-3091.

Sept. 20 (Sat.)—WPaMC's 7th Annual Gary Lincoff Mid-Atlantic Mushroom Foray, North Park PA. See their website above.

National & More

September 18-21---2008
NAMA Foray in McCall, ID .

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See their website, | www.namyco.org, for detail

Membership Application for the Ohio Mushroom Society

NAME _____

ADDRESS _____

CITY _____ STATE _____ ZIP _____

TELEPHONE _____ FAX _____

EMAIL ADDRESS _____

Enclosed please find check or money order: \$10.00 (family) annual _____ \$125 life _____
enrolling me in the Ohio Mushroom Society. My interests are:

Mushroom Eating/Cookery _____ Photography _____ Nature Study _____

Mushroom ID _____ Cultivation _____ Other (specify) _____

Would you like to be an OMS volunteer? In what way? _____

How did you hear about our group? _____

SIGNATURE _____

May OMS provide your name to other mushroom related businesses? Yes ___ No ___

Return form and money to: Ohio Mushroom Society, c/o Jerry Pepera, P. O. Box 1075, Chardon, OH 44024

Reminders: Please send your E-mail and mailing address changes to Jerry Pepera at the above address.

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