fungifama

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SVIMS

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INSIDE;

WINDER'S WOODLOT

As the new mushroom season starts and everyone begins to try to wrap their brain around these mind-numbing keys (is that really an ochre-brown spore print?) t thought I should provide a few words of encouragement to those who are struggling with the identification process. Things can be worse. Those of us who have observed the trying process of identifying mushroom remnants in poisoning cases can tell you that worst case scenarios can be frightfully difficult to deal with. Last year, I alluded to my worst identification nightmare in the list of animal mycophages (mushroom eaters) we gave you. This particular detective story involved a dozen elephants at the North Carolina Zoological Gardens near Ashboro. Many of the larger animals are allowed to range free on fields there, making for a nice natural setting in which to view wildlife, but also allowing them browse on whatever comes their way. In this case, I received a fiat express courier package from the extension people at NCSU, marked urgent. All the mycologists were out of town, and I was the only person available with mushroom experience. The elephants at the zoo were all sick, and the keepers were frightened- could I please identify the contents of the package ASAP, since the elephants had eaten some of the enclosed mushrooms, and it was feared that the beasts might be done for? I looked at the flat envelope and groaned, knowing what I would find. There is no way you could shove an intact mushroom in an envelope that thin, and I knew the size of that herd from previous visits to Ashboro. Sure enough, I delicately pulled out several huge ratty-looking mushroom wafers that looked like- well they looked Ilk-: a herd of elephants had stepped on them! At least they were brown with gills. I groaned again. Even if they were poisonous or hallucinogenic, how would you calculate the number of I.b.m.s (little brown mushrooms) it, would take to make a troop of mature African elephants sick?. Ultimately, through a combination of observing the spores and other features under the microscope and conducting some test smashes of known I.b.m.s with the largest unabridged dictionary I could find, I was able to reconstruct the original size and type of mushroom - Pluteus cervinus, the deer mushroom: I quickly called the zoo to report my findings, and to let them know that there were no reports of mammalian poisonings with P. cervinus. They were relieved, and you'll be happy to know that the elephants quickly recovered from whatever it was that was troubling them. So the next time you're looking at that ocher spore print, just be thankful that your intact mushroom took the time and trouble to make one for you!

I hope to see you all at the foray I'll be leading to the Leechtown area on April 29. My family took a small pre-foray scouting trip out that way and found one immature morel (Morchella esculenta), so there may be more out there coming along, considering that the area is a bit colder as you move away from the sea. Oh, the morel was delicious, by the way. I won't mention names to protect the guilty, but I know of two other SVIMS members who have found about 30 dozen morels so far. Yes, that was dozen. Keep looking - they're out there. - RSW

SOCIETY HIGHLIGHTS

The morel-booster held at Thetis Lake Park at the start of this month didn't result in encouraging any morels to pop up, but it did boost our morale, for it was a beautiful sunny day for a walk. Some of the people present even took a stab at identifying a few I.b.m.s before Hannah "Cryptocybe" Nadel put her foot down and insisted that we stop collecting every dubious brown-capped toadstool in sight. Pluteus spp. seemed to be out in the greatest abundance.

Mushroom Mania night at the general meeting on the following Thursday was a great success. We all had the opportunity to identify a good variety of Spring mushrooms, teaching and learning as we went. I know more than a few members will be looking forward to the next Mushroom Mania. Because of space restrictions for this issue, we'll wait until the next one to print a list of the mushrooms that were brought in for identification. Please see Upcoming Events in this issue for other important developments announced at the meeting. - RSW

LETTER TO THE EDITOR

While browsing in a bookstore in Port AIberni, I stumbled onto: Legends Told by the Old People by AdoIf Hungry Wolf. When I glanced at the list of legends, I was surprised to find that the very last tale came from Vancouver Island. It was called "The Finding of the Tsomass", and describes how two sons of Wick-in-in-ish, of the E-coulth-aht tribe, discovered AIberni Inlet and the Somass River into which it dispenses. This little tale focuses on the Somass and the native people of that area, the Klootsmah, but incidentally makes reference to three kinds of food/mecicine indigenous to the area: KWA-NIS, O-IL-LIE, and OW-YIE. The latter is described as a medicine found high above the timber line and desired greatly by those who hunt whale. The O-IL-LIE is described as luscious to the taste, filling the woods with its bright color. My first reaction was, "are these mushrooms?" Especially in the case of the O-IL-LIE which made me think of chanterelles. A call to the Tseshaht Band office proved futile and I am still mystified as to the identity of these plants. I would be appreciative if anyone has information which may shed light on the mystery, and also for any further stories of native use of mushrooms, especially the West Coast. - Kenneth N. Howes

Ken: Just off the top of my head, kwanis sounds like it may be derived from the Salish word for several types of fungus, quames. I will wait to see what kind of response you get before I comment further. If anyone has an answer for Ken, let me know so we can publish it here, too. -RSW

PANTHERINA POISONINGS

Report by B. Callan

On Thursday, April 6th, I was once again made aware of both the perils and pleasures of spring mushrooms. Those of you who attended the last SVIMS meeting will recall that some lucky person had managed to find a few early morels. Earlier that day, however, I received a call from Victoria General Hospital Emergency, where two three-year-old boys were comatose after ingesting mushrooms growing in the yard where they had been playing. A few minutes later a concerned parent was zooming back to his house to make a mushroom collection, and soon I was heading to the hospital to make an identification. Sure enough, the dad had found a young, perfect Amanita pantherina. This beautiful mushroom had apparently been too tempting for the kids, and the resulting backyard snack had put one of them in Pediatric Intensive Care, and the other in a bed in the Emergency ward. Symptoms had started to appear in approximately 53 minutes, and included dizziness, nausea, failure to respond to the concerned parent. One of the attending doctors invited me in to see the kid who was still in Emergency. The poor fellow had black on his face, left over from the activated charcoal they'd flushed his stomach with. He was starting to regain consciousness somewhat, at least, he was moaning, but he was still not responding to voices. Muscle spasms often occur as a result of A. pantherina poisoning, and the doctor demonstrated this to me by gently tapping the boy's foot and knee. Spastic flailing of the arms and legs resulted.

You'll be happy to hear that both boys recovered, and probably the only lasting effects will be some unpleasant memories and a possible strong aversion to mushrooms!

ASK THE EDfTOR

In this column, we'll be answering your questions about fungi, mushrooms, etc. So please send in your questions (or else anything you ask at a meeting or foray can and will be taken down and used in this column!). Questioners will remain anonymous.

The question of the month is - what is a fungus? To answer this, we also have to discuss what a fungus isn't. Biologists group life (on Earth, anyway) into five main categories called Kingdoms. Starting with the simplest life forms, bacteria and blue-green algae are microbes placed in the Monera, a kingdom of organisms with primitive cells which lack internal structures like a nucleus. Creatures in all of the other kingdoms have cells with nuclei. Microbes which have nuclei, including protozoans and certain simple algae, are sometimes placed in a different kingdom, the Protista. Others, however, divide these simple organisms among the remaining kingdoms, which are the Plants, Animals, and Fungi. Plants are creatures which photosynthesize, making their own 'food' from the energy of sunlight using the green pigment chlorophyll. Plants are largely immobile (although not always), due to the rigid compartmentalization of their cells caused by outer cells walls made of cellulose (paper is mostly cellulose). Animal cells don't photosynthesize. They lack cell walls, allowing these creatures to be fairly lively in their search for food (couch potatoes may be an exception to this rule if they happen to be vegetating in front of T.V. light!). The fungi are a kingdom of organisms which have cell walls made of various compounds like chitin (the same substance found in crab shells and beetle exoskeletons), but they do not directly use sunlight either. Instead, they grow or spread out in search of food (many fungi are parasitic on other organisms), often via thread-like cells called hyphae or by broadcasting spores of various types. So, they are like plants in that they are relatively immobile, but they are like animals in that they don't photosynthesize. These are some pretty simplistic rules, however. There are many creatures that don't clearly fit into one slot or the other, leading biologists to argue about how many kingdoms there really should be, and where to draw the line for each of them. For example, some plants which are parasitic lack chlorophyll - we would ordinarily consider them to be fungi under these

circumstances, but we know that they are at least derived from true plants because of their shape, life cycle, and cellulose cell walls. Some microbiologists consider fungi as simple colonies of cells, and they classify fungi as colonial protistans. Others feel that their lack of chlorophyll isn't that remarkable, and that there shouldn't be a kingdom for Protistans, so they classify fungi as plants (mycology, the study of fungi, is still taught in many botany departments as a matter of convenience). Then there are people like me who like to have lots of little kingdoms, and believe that there are organisms classified as fungi that deserve their own kingdoms (slime molds come to mind). Remember that grouping organisms together is an academic exercise that constructs a way to make sense of the diversity of life on this planet - there always seems to be some joker that doesn't want to follow our rules, simply because our rules are artificial. The fungi that most interest us are the more complex ones which form sexual fruiting bodies that we like to call mushrooms and toadstools. We'll talk more about what mushrooms are in another column. There are other fungi, though, which don't form these large sexual structures. Wheat rust, potato blight, and a host of other plant diseases are caused by fungi of various types. Around the house, there are various molds and mildews which are fungal organisms (as well as the rot in your rafters, if you're unlucky). The yeasts which we use to make bread, wine, and beer are fungi (as well as the ones which are able to colonize humans). Fungi are used to produce antibiotics and other important drugs and chemicals. There are lots of other tiny little things that are fungi - you'll probably never run into them unless you use a microscope a lot. You might run into slime molds though - they are fungi with an attitude. Slime mold cells can swarm together and form an amoebic mass of protoplasm capable of creeping around! You don't have to check under your bed for them, though - they prefer to eat bacteria, not humans. I once kept a pet slime mold in a Petri dish in my desk drawer, feeding it with bacteria growing on oatmeal flakes. We got along fine until one day Slimy managed to squeeze a pseudopod under the cover and out into the wide world. I came into the office to find my alarmed officemates dubiously staring at this big mass of yellow slime oozing out of my drawer and over the bookshelves in search of food. I used some bait to encourage most of it back into a bigger container - but for Slimy I'm sure it was a moment worthy enough to be included in an episode of Wild Kingdom. -RSW

IN DEPTH; MAKING MUSHROOMS

Part 1. Mycorrhizal mushrooms

by R. Winder

Recently, I posted some information to Internet about the possibilities of cultivating mycorrhizal mushrooms, fungi which are highly prized by gourmets but which don't ordinarily fruit under artificial conditions, it stirred up quite a reaction, so I'll summarize the discussion here.

It all started when Paul Stewart of P.E.I. posted a request for more information on the culture of mycorrhizal mushrooms. He has grown mycelia of Boletus edulis, chanterelles, and slippery jacks, and was interested in any information that might help him produce mushrooms from the cultures. I responded with some guesses' about factors to worry about, some of which I will back up here by citing some literature. Most of these factors are probably inter-related.

-Mycelium integrity and size. Mushrooms like B. edulis can be quite large. Such mushrooms probably need to achieve a certain mycelial size before they commit water and nutrients to a fruiting body (6). This is probably one of the reasons that deep dish cultures with modified Hagem-Modess media can be used to produce Leccinum, Tylopilus, Xerocomus, and Boletus mushrooms in culture, including B. rubinellus (6) and B. edulis (5). Some reports suggest that truffle fruiting bodies eventually become independent from their host (14), so this may be a dynamic variable.

-Water relations. Even if resources have been committed to a fruiting body, larger mushrooms might abort if the medium becomes too dry. Proper water flow could also be involved in wicking away inhibitory waste compounds or by-products such as phenolics.

Nutrient flux. A clear source-sink flow of nutrients may need to be established, as outlined in methods which can be used to reliably produce morel sclerotia (1) as well as patented methods for growing morels in artificial culture (8). A disruption of this flux might also be a necessary stress for inducing fruiting.

-Inhibitors. In the case of deliberately produced inhibitors, rain might be a signal. It is known that some fungi produce diffusible compounds (cerebrosides) which encourage the formation of fruiting bodies - so inhibitors may also be present. By way of analogy, plant seeds often require water to leach away inhibitors linked with dormancy. In artificial culture, there may be an unintentional accumulation of inhibitors or waste products because a closed system is being used. Armillaria is an interesting mushroom to talk about with regard to inhibitors. Depending on concentration and type, phenolic compounds can inhibit or stimulate the growth of this fungus (10). Orange slices are often added to media to stimulate formation of Armillaria mushrooms (10). It may be that the ascorbic acid (vitamin C) in the orange counteracts the effects of phenolic compounds in the media. Ascorbic acid is often used in plant tissue culture to deal with the problem of accumulated phenolic wastes.

-Templates. Microscopic fungi which do not ordinarily produce fruiting bodies in liquid culture often produce them if something solid is added to the medium. In agar media with plant pieces, these fungi often prefer to form fruiting bodies on the plant pieces. In Agaricus culture, texture of the surface casing layer can be important in determining the density of primordia. So for Armillaria culture, the addition of orange peels also provides a good hunk of cellulose which probably acts as a nutritious growth template.

-Seasonal factors. The B. edulis in my front yard always fruits exactly on Canada day (July 1), with the deeper Amanita muscaria 2 days behind. This might be a direct effect of day length or photoperiod. However, there may be a more indirect explanation for the timing of mycorrhizal mushroom fruiting since they are, after all, symbiotically connected to plants. Plant growth hormones are intimately involved in the formation of mycorrhizal associations, and might also be involved in the fruiting of the fungal symbiont. I've used the plant growth hormone IAA to trigger the formation of morel sclerotia. Other hormones such as abscisic acid, ethylene, or cytokinins might be involved. Temperature is another important seasonal aspect - B. edulis fruits between 20-26 degrees C (5).

-Nutrients. Mycologists like media that are simple to prepare, with simple sugars like glucose and sucrose. However, mycorrhizal mushrooms aren't necessarily living on simple sugars like an ordinary saprophyte - they are getting at least some of their nutrients from tree roots. Tree sap has a

mixture of different sugars and amino acids - some not found in popular growth media. There are also more complex compounds to consider, like pectins, suberin, and various other components of plant cell walls and plant tissues. In some cases, there might be a requirement for a physiological trigger from a living plant symbiont, such as phosphorylated compounds, nucleotides, glycolipids, etc. (just guessing here!) On a more basic level, the approach of Paul Stewart to chanterelle culture is a good one. He compared soil where chanterelles grow with nearby soil, and found that chanterelles seem to bioaccumulate manganese, boron, and calcium in significant quantities. Manganese and calcium have also been found to stimulated morel growth, along with wood extract. There has been some work on nutrients required for growth of Boletus spp. (9), chanterelles (11), and truffles (7). I'll leave morels, which some reports say can be mycorrhizal, for a column of their own.

-Other microbes. Chanterelles incorporate the bacterium Pseudomonas fluorescens into the mushroom, possibly the result of some sort of symbiosis (2). Levels of bacteria in truffles (Tuber spp.) are also high (7). It may be that bacterial cell wall components like n-acetyl-glucosamine could be incorporated into the medium to avoid the contamination problems posed by these symbionts. Some soil bacteria produce ion-absorbing compounds known as ionophores - symbiotic association with these bacteria might be an additional way for mushrooms to accumulate nutrients. In Agaricus culture, various microbes aid in mushroom formation by providing competitive stress or an environmental cue (12). They can also aid in spore germination. Recently, Mike Ziegler of snowy Vermont posted to internet his discovery that growing two fungi together in the same culture has allowed him to produce fruiting bodies of Grifola frondosa (sheep's head or hen-of-the-woods). The implications for culture of mycorrhizal mushrooms are there: I have three isolated grand fir trees which support mycelia of B. edulis, Amanita muscaria, A. pantherina, Helvella lacunosa, and a couple of other mushrooms I haven't bothered to identify. The point is, they are all living together quite happily.

After I posted this information, Lewis Melville at the University of Guelph said that he has published a book, Practical Methods in Mycorrhiza Research, which contains information on culturing and isolating ectomycorrhizal fungi. It is available from Mycologue Publications, 8728 Lochside Drive, Sidney, B.C. V8L 1M8, Canada, for $23 US. Lewis says that culturing endomycorrhizal fungi is usually done in pot cultures with a living host plant. From my own files, I've found a reference to culture of the ectomycorrhizal Laccaria spp. using this method (13), as well as desert truffles (3).

Richard Kerrigan, who works for the friendly people at Sylvan Spawn Labs, added a point. He says that Station Champignons, a research lab at INRA-Bordeaux, has been conducting successful research on cultivation of mycorrhizal fungi, including truffles and Lactarius, for over 15 years. The contact there is Dr. J.-M.' Olivier, BP 81, 33883 Villenave d'Ornon, France. Richard also mentioned that although culture of matsutake (Tricholoma matsutake) has been unsuccessful to date, Dr. Makoto Ogawa of Japan has been working on this topic. If anyone finds a B.C. matsutake (T. magnivelare, a.k.a, pine mushroom) I would like to get a piece of it for culturing.

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UPCOMING EVENTS

** Notice: The calendar is filling up fast. If you hold a secret desire in your heart to lead a foray, please let us know where and when quickly! Foray leaders don't have to be mushroom expert s- they should ensure that one is available, though, and they should definitely be able to lead people through a likely area without getting them lost.

29 April (Saturday) Leechtown foray

Leader: Richard Winder. Meet at 10:00 a.m. in Sooke at the Evergreen Mall parking lot by the logger's pole monument (same place as Renfrew Rally last year). Foray will commence on a fairly decent logging road toward Leechtown, stopping at likely locations. Call Richard at 642-7528 for details.

29 April (Saturday) "Flowers and Mushrooms" field trip

Ingeborg Woodsworth is leading a field trip with the Cowichan Valley Naturalists, starting at noon from her home at 6596 McLean Rd., Lake Cowichan. For more info, call Ingeborg at 749-6291

4 May Monthly meeting

Speaker: Brenda Callan. Topic: What's in a name? Brenda will cover the lighter side of naming mushrooms as well as the practical benefits of correctly preserving and depositing the different kinds of mushrooms that SVIMS members find. A tour of the herbarium at the Pacific Forestry Centre will be included. Premeeting: The meeting room will be booked for an extra hour prior to the meeting to allow the foray committee and persons interested in scheduling forays to discuss further plans for the year. Because of security arrangements in the building, people attending the foray discussion should try to arrive promptly at 6:00 p.m.

May 5-7 (Friday-Sunday) LA Mycological Society Morel Foray

Camping at a Forest Service group camp at 6,600 feet in the Barton Flats area of the San Bernardino Mountains. SVIMS members can contact R. Winder for more information.

22 May (Monday) "Menu from the Woods"

Ingeborg Woodsworth will conduct a field trip for beginners, on edible plants and mushrooms. Meet no later than 10:00 a.m at her house (6596 McLean Rd., Lake Cowichan). She'll provide a salad. For more info, call Ingeborg at 749-6291.

27 May (Saturday) GARAGE SALE FUNDRAISER

4040 Nelthorpe (Church hall) (See over lot details)

1 June Monthly meeting

Mushroom mania night - bring a mushroom with a spore print for identification practice.

4 June Field trip to Lake Cowichan

Leader: Ingeborg Woodsworth. Meet at her house (6596 McLean Rd., Lake Cowichan) at 9:30 a.m. For more info, call Ingeborg at 749-6291.

8 July B. edulis BBQ

Informal gathering in sunny Saseenos at the Winder Estate, 5614 Woodlands, Sooke. Fresh B. edulis will be supplied, providing the boletes are on their usual friendly schedule and the chickens, deer, rabbits, and poachers stay away from them. If not, we'll fall back on oyster mushrooms again. You can call 642-7528 for details (but there really aren't any!)

7 September (Thursday) Monthly meeting

Scheduled speaker: Ted Underhill (gourmet mushroom taster)

? September Duncan area Agaricus Foray (TBA)

7 October (Saturday) Second Annual Renfrew Rally

Leader: R. Winder (The bridge is supposed to be in by then)

20-22 October SVIMS/VMS Fall Foray

Lake Cowichan. Organizer: Shannon Berch

MORCHELLA

SVIMS

WE NEED

BAKED GOODS - BOOKS
SMALL APPLIANCES - UTENSILS –TOYS
DISHES - PLANTS - WHITE ELEPHANTS - TOOLS - ETC.

FOR OUR:

GARAGE SALE

AT THE: CHURCH HALL, 4040 NELTHORPE
(OFF SAANICH RD. NORTH OF McKENZIE)

PLEASE: BRING ITEMS TO THE HALL FRI. MAY 26,.3 P.M.- 7 P.M.

MORE HELP NEEDED TO SET UP, PRICE & SELL ON SAT.
FOR INFORMATION: KEN & MARIA 479-3862