Mycena News

The Mycological Society of San Francisco December, 2011, vol. 63:04

December 12th MSSF Holiday Dinner

Continue the Holiday Tradition

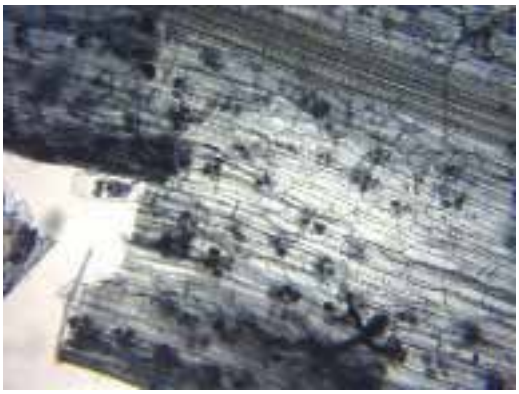
In lieu of a monthly meeting we'll have our annual holiday dinner this December 12th at Nick's Seashore Restaurant in Pacifica. Cocktails start at 6:30, dinner at 7:30. Reservation deadline is December 5th. Please register online or call Curt Haney at (415)-333-8820 with questions and reservations.

This year's holiday dinner is all inclusive, even the wine, so there is no need to bring your own bottle and pay corkage. The portion sizes at this restaurant are substantial and no one will leave hungry. Additionally, there are no volunteers, assistance from the culinary group, or appetizers needed for this dinner, so please do not bring appetizers.

Make your reservation today!

MycoDigest: Fair Trade Fungi

By Peter Werner



Arbuscular mycorrhiza seen under microscope. Flax root cortical cells containing paired arbuscules.
(Courtesy MS Turmel, University of Manitoba, Plant Science Department.)

Mycorrhiza, the relationship in which fungi trade mineral nutrients, water, and other soil resources with plants for food in the form of carbohydrates, is often thought of as a model of co-operative mutualism. But is it necessarily? After all, there are many kinds of fungal root parasites that have at least some traits that resemble mycorrhizal fungi, and there are a broad range of plants that are myco-heterotrophs, "mycorrhizal cheaters" that function in many ways like mycorrhizal plants, but in fact, parasitize mycorrhizal fungi and their associated plants by taking up minerals and food without giving anything in return.
Furthermore, not all mutualistic symbiosis is of equal benefit to both partners, and in many cases there is a dominant partner that controls the symbiosis. Lichens are a prime example of this, where the fungi are the dominant partner and, in a sense, hold captive the algae or cyanobacteria they live in intimate association with. Mutualisms in which one partner can easily turn the relationship into an exploitative one without pushback from the other tend to degenerate into parasitic relationships over time unless the other partner evolves control mechanisms of its own to keep the benefits of the relationship mutual.
And yet, mycorrhiza is a very old association, dating back to (and playing a key role in) the colonization of land by the first non-aquatic plant life. Fossil arbuscular mycorrhizas that resemble living mycorrhizas today have been found in the Early Devonian Rhynie chert, some 410 million years old. This would

MycoDigest is dedicated to the scientific review of mycological information.

President's Post

As we approach the end of the year mycological happenings are as usual all around us. Next stop, MSSF Fungus Fair at Lawrence Hall of Science, December 3-4. This is our biggest event of the year and as our annual fundraiser it is also the source of funding for our scholarships and other educational efforts the Society is chartered with.

So how can you help? So glad to hear you ask that. Volunteering for MSSF is the best thing members can do to help sustain the organization, and the Fungus Fair is our largest volunteer effort, requiring literally hundreds of volunteers. If you are new to the society or to mushrooms in general, there is no better way than volunteering to get to know the membership plus lots about mushrooms; remember, we collect, key, and exhibit hundreds of species for this event every year. More information is available on the Web site, or you can email Stephanie Wright, volunteer coordinator, at FungusFair@ByteWright.com .

Looking back at November, we had a great and busy month as a club, starting with the Culinary Group dinner, which featured a Mayan/Mexican theme including two kinds of Mole and Sopa de Pan. This is some of my favorite cuisine, and we have an "in-house" expert on this region of the world as well as its culinary delights, George Collier. Many thanks for your extensive volunteering with the Society, George.

The second weekend of the month featured an overnight camping foray to Salt Point. Attendees reported a good variety and quantity of fungal finds as part of that trip.

For our general meeting, Dr. Xiang-Hua Wang presented on the edible and poisonous species in Yunnan, China. Dr Wang's talk was well received and we thank her for making the long journey here with her son to talk to the club.

Coming into the end of November, we had another great annual MSSF Mendo foray featuring guided forays, gourmet mushroom meals, and presentations by Else Vellinga on Friday and Gary Lincoff for the Saturday program. Mendocino camp is always a great trip. This year the fruiting was plentiful and the weather wet but not too cold, which is a plus in light of the "rustic" accommodations offered onsite at this event. For those of you that make this trip an annual ritual, you know what I mean.

In closing I want to thank all of our hard working volunteers, who are basically in high gear from fall to the end each year to help us execute the excellent and varied events that we are proud to have as part of the MSSF tradition. As I implore each of you every month, please consider volunteering to help if you are not already. Your best chance to get involved immediately, the Fungus Fair, is happening just days from your receiving this.

I hope everyone has a happy and safe holiday season and I look forward to seeing you all in the new year.

~Lou

Culinary Corner

November's Culinary Dinner was a trip to Chiapas for a Mexican/Mayan feast. We started with a tequila-candy cap punch from Victoria D'Amato-Moran of Cent'Anni Cocktails, paired with many fabulous appetizers. The main menu was red and green mole sauces with chicken, and sopa de pan (a kind of savory bread pudding) with oyster mushrooms, courtesy of George and Jane Collier – with help on the sopa de pan from Bill and Carol Hellums – curtido salad (think Mexican coleslaw) and tortillas from Jenn Clark. Dessert was ice cream with dulce de leche sauce from Roy Coto, plus coffee from Carol Reed.

George Collier, the dinner Captain, introduced the meal with a brief introduction to the region and the chef who gave him this recipe for sopa de pan: Maria Luisa Porras lived in San Cristóbal de Las Casas, Chiapas, from about 1945 to 2005. She helped care for the Collier children while George and Jane Collier did anthropological fieldwork during the 1960s. Maria became an expert chef. In her later years, she became a spiritualist, helping clients solve their personal problems through the medium of contact through the dead. This intriguing dish, sopa de pan, reflects her multifaceted personality and her talent for subjective nuance. Enjoy it.

Maria Luisa Porras's Sopa de Pan (for 5)

7 little round sugar-topped rolls (see note 1)

2 little long sour rolls (see note 1)

2 ripe platanos (plantains)

¾ lb. mushrooms (see note 2)

2 big carrots

3 little round green summer squashes

3 cups green beans

½ large onion

2 tomatoes

3 cups boiling water (see note 3)

2 T. consommé powder (see note 3)

Pinch saffron

1 stick cinnamon

Few sprigs thyme

Few sprigs oregano

Ground black pepper

Raisins

Blanched almonds

3 eggs

¼ Kg. manteca (lard) (see note 4)

Slice bread and toast in oven until dry but not brown. Hard-boil 3 eggs. Peel and slice into rounds. Peel and cut carrots in rounds. Cut squashes in rounds. Cut green beans in ¼-in. pieces. Boil

together in salted water until carrots are tender. Drain. Slice platanos and fry in oil until browned on both sides. Fry mushrooms in oil. Slice onion and tomato in rounds. Fry in oil remaining from platanos, with onion slices on the bottom and tomato slices on top, until mushy.

Boil together in salted water until carrots are tender. Drain. Slice platanos and fry in oil until browned on both sides. Fry mushrooms in oil. Slice onion and tomato in rounds. Fry in oil remaining from platanos, with onion slices on the bottom and tomato slices on top, until mushy.

Boil water; add herbs, spices, and consommé powder; simmer about 15 minutes, until tasty; strain out solids.

Grease the bottom and sides of a large pan with manteca or oil. Put a layer of bread on the bottom and as far up the sides as possible. Add a layer of platanos, lining bottom and sides. Pour the green beans in the middle, topping with a layer of carrots, squash, and mushrooms. Cover the top with the cooked onion and tomatoes. Add a layer of raisins and almonds. Pour the strained broth over the entire dish. Cook in a medium over (350 degrees) for ½ hour or more. About 15 minutes before removing, add egg slices to the top of the dish.

Culinary Corner continued on page 5

2011 MSSF FUNGUS FAIR at the LAWRENCE HALL OF SCIENCE

Saturday, December 3rd and Sunday, December 4th

Volunteers needed before and during the fair for mushroom collection forays, booths and more.

Mushroom collection forays
Friday, December 4, 10 am to 2 pm
Check the calendar on the MSSF website for updates

Set up: small tasks for all levels of experience
Friday, December 3, 3:30 to 7:30 pm or 7:00 to 11 pm
Saturday and Sunday 10 am to 5 pm

Dinner will be provided Friday evening; lunch will be provided Saturday and Sunday. Shift obligation is three and a half hours for free admission to the museum throughout the weekend. To sign up for Friday evening, Saturday or Sunday shifts go to the MSSF website and follow the link to volunteering for the Fungus Fair; if you have difficulty then contact Stephanie Wright at: FungusFair@ByteWright.com

Annual Mills Canyon Introductory Foray with JR Blair
January 14, 2012

Time to hit the trial for a clear introduction to the world of local mushrooms. We meet at the Adeline Drive entrance at 10:00 AM. Heavy rain cancels. Wear durable shoes, the 1-1/2 mile trail with little elevation could be wet. We usually finish about 12:30 PM

For reservations please call or Bill Freedman @650-344-7774 or JR Blair @650-728-9405

Mycena News

December 2011, vol. 63:04

Contributors:
Peter Werner, Carol Hellums, Lisa Bacon, Lou Prestia

Illustrations:
Dorothy Beebee

Editing and Layout:
Max Garrone

Mycena News is the members' newsletter of the Mycological Society of San Francisco, published monthly from September to June.

Please e-mail photos, comments, corrections, and correspondence to mycenanews@mssf.org.

To subscribe, renew, or make address changes, please contact Alvaro Carvajal: alvaro.carvajal@sbcglobal.net or (415) 695-0466.

Past issues of *Mycena News* can be read online at www.mssf.org.

MSSF Officers 2010-2011

President: Lou Prestia
(510) 597-0214
lou@prestia.com

Vice-President: Curt Haney
(415) 333-8820
lingking@sbcglobal.net

Secretary: Donald Hughes
510-919-8866
hard-dharma-sage@sbcglobal.net

Treasurer: Henry Shaw
(925) 551-8243
hfshaw@yahoo.com

Fair trade fungi -Continued from page 1

imply that this association between fungi and plants is very stable and that there are mechanisms on both sides to keep it mutually beneficial.

Recently, this idea was put to the test by an international group of scientists led by Toby Kiers of Vrije Universiteit, Amsterdam. The researchers hypothesized that for the mutualism to be truly stable, the relationship should be regulated by both partners. Plants should be able to allocate less carbon to fungi that offered the plant less phosphorus (thought to be the major and most critical nutrient provided to plants by *arbuscular mycorrhizal* fungi), and fungi should be able to offer less phosphorus to plants that offered less carbon.

The experiment was conducted using arbuscular mycorrhizal (AM) fungi, which are largely microscopic fungi in the Glomeromycota that form associations with the majority of the world's plant species. (Note that this is a different kind of mycorrhizal association from what we're used to as mushroom hunters – the ectomycorrhizas, in which asco- and *basidiomycetes*, often mushroom-forming ones, are associated with a select few plant groups, typically certain families of trees and shrubs.) The fungi chosen for the experiment were closely-related species of Glomus with differing phosphorus-sharing abilities, tested with the plant *Medicago truncatula*, a laboratory workhorse in the bean family (and closely related to alfalfa) often used in experiments examining mycorrhizal as well as nitrogen-fixing bacterial symbiosis.

The series of experiments involved providing stable heavy isotopes of carbon or phosphorus to one partner and testing how much ended up in the symbiont. Plant-to-fungus nutrient flow was tested using carbon-13 and -14, and fungus-to-plant flow was tested using phosphorus-32 and -33. In the first set of experiments, Medicago were inoculated with the "cooperative" species of Glomus intraradices that readily shared phosphorus, and several other "less cooperative" species (*G. aggregatum* and *G. custos*) that were less forthcoming with phosphorus. The plants were given 13CO2 during their growth. The roots and associated fungi were later harvested and RNA extracted, and selective primers used to isolate out RNA coming from each species of Glomus. From here, the amount of 13C that found its way into the RNA of each species could be quantified. (This is thought to be well-correlated with the amount of 13C that goes into the plant's biomass overall.)

The results supported the hypothesis that plants rewarded AM fungal species that were known to provide more phosphorus, with the more cooperative Glomus species ending up with a higher proportion of 13C in its RNA than the less cooperative species. However, further testing needed to be done to understand how the fungi treated differing contributions from the plant, and whether the plant's reaction was truly a reaction to different amounts of phosphorus being offered, or whether the plant simply rewarded different Glomus species differently, regardless of the amount of phosphorus the plant gets.

To answer this, an experiment was done using a sophisticated Petri dish design. Fungal cultures and Medicago root-tissue cultures were grown side-by-side in three isolated compartments. Later, the three subcultures were brought together so the plant and fungal cultures could associate and inoculate the roots with AM fungi. In one set of experiments, plants were fed 14C-tagged sucrose in one compartment, and no extra sucrose in another; fungi grew in a third compartment, and the fungi were later paired either with high-sucrose or low-sucrose roots, the latter being expected to provide little if any carbon to the fungi. In a reciprocal set of experiments, fungi were provided with 32P-tagged orthophosphate or no orthophosphate, with a root culture grown in the third compartment. In each set of experiments, the fungi were represented by two subsets consisting of "cooperative" *G. intraradices* and "less cooperative" *G. aggregatum*.

Again, the results supported the hypothesis that both plants and fungi directly reciprocated with less reward to partners providing less sugar or orthophosphate, and plants providing less reward to fungal species that were less sharing with available phosphorus. Cooperative Glomus that had been given (and presumably passed along) phosphate ended up with significantly more 14C than those without phosphate, while such was not the case with less-cooperative Glomus, regardless of available phosphorus. Similarly, roots given high levels of sucrose, and hence providing more to the fungi, ended up with significantly more 32P allocated to the fungal arbuscular compartment within the plant's root cells. However, this was true with both the cooperative and less-cooperative Glomus. Closer analysis of the orthophosphate held in the arbuscular compartments told the whole story – the cooperative species stored more of the phosphate compound in a short-chain form readily available to the plant, whereas the less cooperative one stored more of the phosphate in a long-chain form available to the fungus, but not to the plant. The less-cooperative fungus hence "hoarded" available carbon and the plant responded accordingly with less of a sugar reward.

This series of experiments establishes that in the case of arbuscular mycorrhizas, mycorrhiza is indeed tightly regulated by both partners in a kind of "biological market". This two-way control of the symbiosis should have a stabilizing effect on the relationship, and would explain its long persistence, as indicated by the fossil record. Further experimentation will be needed to see if this two-way control is true of ectomycorrhiza and other mycorrhizal systems as well.

The experiment raises other interesting questions that will also require further lines of inquiry. Like other types of mycorrhizas, there are a number of myco-heterotrophic "cheater" plants that parasitize AM fungi, not only getting phosphate and other minerals without providing carbon in return, but actually reversing the normal nutrient flow and getting carbon from the fungus. There is also at least one known case of a "cheater" AM fungus, in which the normally mutualistic *Glomus macrocarpum* acts as a parasite of tobacco, causing a wilting disease. How do these

species overcome the normal tendency of plants and fungi to turn off reciprocation when the other partner is not donating its share? And in the case of myco-heterotrophs, which are known to have independently evolved a number of times, how does the fact that cheater plants commonly emerge within mycorrhizal evolutionary lines not destabilize the relationship over evolutionary time? As always, answering a scientific question raises many more.

About the Author:

Peter Werner (pgwerner@sonic.net) is a mycologist, a microscopy and imaging specialist, a biological photography enthusiast, and all-around science and natural history buff. After having earned his bachelor's degree in botany from University of Washington, he studied fungal taxonomy for several years as a graduate student at SFSU. He has been an active mushroomer for the last 30 years and is a long-time member of MSSF.

Further reading:

Milius S. 2011. Plants and fungi recognize generous trading partners. Science News 180(6):15. Available from: http://tinyurl.com/snews2011

Selosse M-A, Rousset F. The plant-fungal marketplace. Science 333(6044):828–829. doi:10.1126/science.1210722. Available from: http://tinyurl.com/selosse2011

Kiers ET, et al. 2011. Reciprocal rewards stabilize cooperation in the mycorrhizal symbiosis. Science 333(6044):880–882. doi:10.1126/science.1208473. Available from: http://tinyurl.com/kiers2011; supplementary material: http://tinyurl.com/kiers2011Sup

Additional reading: http://germpore.blogspot.com/2011/11/more-on-mycorrhizas.html

Culinary Corner - Continued from page 2

Notes

• We used whole-wheat foccacias from Great Harvest Bakery, Alemany Farmers' Market – cut in half horizontally – enough to line the bottom and sides of each pan.

• The mushrooms aren't traditional, but they are tasty. We used oyster and king trumpet mushrooms from Far West Fungi.

• For the non-veggie one, we used chicken broth from the poached chicken served with the mole sauce.

• Vegetable oil or butter is ok.

December 2011 Dinner

There is no culinary group dinner in December since we are having the annual MSSF Holiday Dinner on December 12. Please refer to the following link for more information:

http://mms.mssf.org/Calendar/moreinfo.php?eventid=16273

January 2012 Dinner

The January 9 dinner will be a Japanese New Year Dinner, served as a variety of small dishes. Tom Sasaki will be the captain. The menu is:

Soup: Matsutake soup (if mushrooms are available) or substitute

Starch: Age sushi (vinegared rice in fried tofu sacks)

Vegetables: served in small dish style

cucumber namasu - cucumber with vinegar dressing

black mushrooms – shiitake cooked in soy and sake sauce

spinach with tofu sauce

Main courses:

teriyaki chicken – equivalent to one leg (drumstick and thigh)

tuna sashimi with wasabi (mustard) and soy sauce – 3 slices

shrimp with long whiskers - 2-3 pieces

Dessert: red kanten (agar agar) with crushed pineapple (prepared and eaten like jello (Lisa is from Des Moines, IA – aka, jello capital of the world…I can't wait!)

Volunteers are needed to prepare the dishes. It's a great opportunity to learn or practice Japanese cookery! Contact Tom Sasaki for recipes – phone 415-776-0791 or email sasakitom@sbcglobal.net. Volunteers are also needed to set up the room and clean up afterward. Contact Tom to volunteer.

Culinary Group General Information

The Culinary Group (CG) meets on the first Monday of each month (except September and sometimes January) at 7 p.m. at the San Francisco County Fair Building (a.k.a. Hall of Flowers), Golden Gate Park, 9th and Lincoln, SF. The dinners are open to current members of MSSF and the Culinary Group, and their guests. Membership in the CG is $10 per year and can be paid on-line or at the Monday dinners.

Each dinner is led by a "captain" who sets the menu and organizes volunteers to cook the dishes, as well as handle setup and cleanup.

Reservations for all dinners except the September potluck are required and must be made no later than the Wednesday before the dinner. To make reservations online, go to the web site, mssf.org. Select the calendar and click on the event, or go to the members' area and click on "event registration". You may also contact Bill and Carol Hellums at 415-347-7444 for reservations or other information.

We keep our reservation numbers at a maximum of 60, so reserve earlier rather than later.

Be sure to bring all your own tableware and table covering, as the venue does not provide linens, dishes, utensils, glassware, etc. Also bring your favorite dinner beverage and an appetizer to share. Unless otherwise noted, dinners are $16 per person, $15 for seniors and students, payable on line or at the dinner.

~Lisa Bacon and Carol Hellums

Mycological Society of San Francisco
c/o The Randall Museum
199 Museum Way
San Francisco, CA 94114

First Class Mail
U.S. Postage
PAID
Oakland, CA
Permit No. 1451

December, 2011, vol. 63:04

MSSF Calendar December 2011

December 2nd:	Fungus Fair Forays
December 3rd-4th:	MSSF Fungus Fair
December 12th:	MSSF Holiday Dinner
January 8th:	SF Beginner's Foray
January 8th:	Pt Reyes ID Class
January 10th:	January Council Meeting
January 21st-22nd:	Pt Reyes Mushroom Camp
January 27-29th:	All California Club Foray

Special Events

SOMA Wild Mushroom Camp January 14-16 2012

The 15th annual SOMA Wild Mushroom Camp will be held near Occidental, in Sonoma County. The public is invited. Special guests will be confirmed soon, main speaker is Andrew Weil, M.D. For more information check the SOMA site.

2012 MushRoaming Tours

Bolivian Amazon with Larry Evans: Jan 20 to Feb. 2
Tibet Cordyceps Expedition May 28 to June 10
Tibet Summer Fungal & Floral Foray July 17 to 30
For more details please check www.MushRoaming.com

Check the MSSF online calendar at:
http://www.mssf.org/calendar/index.php
for full details, latest updates and schedule changes.