SPORE PRINTS

BULLETIN OF THE PUGET SOUND MYCOLOGICAL SOCIETY
Number 490 March 2013

THOUGHTS ON FUNGAL TAXONOMY

Igor Safonov
NJMA News, New Jersey Myco. Assoc., Jan./Feb., 2013

Traditional mushroom taxonomy based on both macroscopic and microscopic properties of fruit bodies has come a long way since the "ancient" times of Linnaeus and Persoon. Each subsequent generation of professional mycologists around the globe continuously advances, redefines, and refines this ever-developing field based on theories of the past and discoveries of the contemporary day.

Thanks to the earnest efforts of "splitters" and "lumpers" spanning over the course of more than two centuries, numerous families and genera of mushrooms have been created and destroyed, species concepts have been erected only to be disproven later, binomial names have been given to new species only to be changed time and again, and countless species have been incessantly moved from one genus to another only to be finally relegated to one of several "wastebasket taxons" until better times. No other kingdom of life, with the exception of microbes, has perhaps undergone such an extensive and drastic reclassification since its inception than that of fungi.

Although this optimization process is still very much alive with no end in sight, it seems that classical mushroom taxonomy may have already reached its apogee before having exhausted all its resources. A new "quantum leap," called DNA phylogeny, forged by recent advances in molecular biology as well as equally important ancillary technological breakthroughs, has shown that the genetic code is the only key that will allow us to unlock the evolutionary mysteries of the humongous and exquisitely complex fungal tree of life. However, even in our evolved post-genomic world, molecular phylogeny is still very much in its infancy, and thus far it has produced more questions than answers.

One day, affordable hand-held mushroom DNA analyzers will be as common as smartphones are today, but until such time, our ability to identify mushroom species in the field will continue to rely heavily on the vast volume of printed literature brought to us by the classically trained mycologists of the past and present.

ASTHMA SUFFERS HAVE MORE LUNG FUNGI

www.futurity, Feb. 19, 2013

CARDIFF U. (UK) - Healthy lungs are full of fungi, but some species are more common in people with asthma, new research finds.

Hundreds of tiny fungal particles found in the lungs of asthma sufferers could offer new clues in the development of new treatments, according to a team of scientists.

"Historically, the lungs were thought to be sterile," according to Hugo van Woerden from Cardiff University's Institute of Primary Care and Public Health, who led the research.

"Our analysis found that there are large numbers of fungi present in healthy human lungs. The study also demonstrates that asthma patients have a large number of fungi in their lungs and that the species of fungi are quite different to those present in the lungs of healthy individuals," he adds.

By examining the mucus or sputum of patients with and without asthma, the team found some 136 different fungal species with 90 species being more common in asthma patients and 46 more common in healthy individuals.

Having established the presence of fungi in the lungs of patients with asthma, the researchers now hope this could lead to new lines of research and, eventually, better treatments for sufferers.

"Establishing the presence of fungi in the lungs of patients with asthma could potentially open up a new field of research which brings together molecular techniques for detecting fungi and developing treatments for asthma," van Woerden says.

"In the future it is conceivable that individual patients may have their sputum tested for fungi and their treatment adjusted accordingly," he adds.

This is not the first time the Cardiff researchers have made the link between fungi and asthma. Their previous research found that by removing fungi from people's homes, they could also help improve life for sufferers.

The journal *BMC Infectious Diseases* published findings from the most recent study.

PLANETARY DISASTERS: DEATH BY FUNGUS

Nicola Jones

Extracted from "Catastrophes from the Past Will Strike Again—We Just Do Not Know When" *Nature*, Jan. 8, 2013

Although viruses and bacteria grab more attention, fungi are the planet's biggest killers. Of all the pathogens being tracked, fungi have caused more than 70 percent of the recorded global and regional extinctions,* and now threaten amphibians, bats, and bees. The Irish potato famine in the 1840s showed just how devastating such pathogens can be. *Phytophthora infestans* (an organism similar to, and often grouped with, fungi) wiped out as much as three-quarters of the potato crop in Ireland and led to the death of one million people.

Potato blight is still a threat: 13_A2, a highly aggressive strain of *P. infestans*, is now rampant in Europe and North Africa. Across the globe, *Phytophthora* causes some US$6.7 billion in annual damages, according to a 2009 estimate.** Sarah Gurr, a plant pathologist at the University of Oxford, UK, estimates that the worst theoretical potato infestation would deprive 1.3 billion people of

*Fisher. M.C. et al. 2012, *Nature* **494**, 186–194
Haas, B.G. et al. 2009, *Nature* **461, 393–398

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CALENDAR

Mar. 16	Survivor's Banquet and Annual Business Meeting, 7:30 pm, Polish Home Association, 1714 18th Ave., Seattle (Capitol Hill)
Mar. 18	Board Meeting, 7:30 pm, CUH Board Room
Mar. 19	*Spore Prints* deadline
Apr. 6	Field Trip (see website)
Apr. 9	Membership Meeting, 7:30 pm, CUH

BOARD NEWS — Denise Banaszewski

Please remember to vote for the Board members. Next year, we will have electronic voting, but this year please send in your ballot. We have approved a scholarship for Heather Buzzard, who is involved in early childhood education. Heather will attend the Mushroom Cultivation Workshop in Eugene on March 23. In return, we will request a copy of the the curriculum she develops. Our Survivors' Banquet is coming up on March 16. Please sign up and come enjoy this delicious feast. Also please consider signing up to help set up or clean up if you are attending—just go to the www.psms.org website under "Events." We have developed a job description for our new Scientific Advisor, and will continue our search. We have a Strategy and Planning Committee, and they met and came up with ideas for people to chair various new committees. We will be adding the committees to the website. Please think about volunteering to be on a committee and get involved! We will not be having a spring foray, but may consider having a foray in the fall. See you at the banquet!

ANNUAL MARCH BUSINESS MEETING AND SURVIVORS' BANQUET

Saturday, March 16, 2013, at the **Polish Home Association**, 1714 18th Avenue, Seattle, WA 98122, on Capitol Hill (Note new location.)

The club gathers each year in March to congratulate each other for making it through another season of finding, identifying, cooking, and eating mushrooms. We also have our annual business meeting at which we present our newly elected officers and trustees. The theme this year will be "Clothes for the Compleat Mushroom Hunter," so please come appropriately dressed in your fabulous foraging finery for the field and forest.

Last year at CUH there was a great turnout and as a result there were no seats for the latecomers. We decided that we needed more space this year, so our event is at the Polish Home Association on 18th Ave., just off E. Madison St. on Capitol Hill (see: http://www.polishhome.org/DirectionsEng.htm).

The social hour is at 6:30 pm and the potluck dinner starts at 7:30 pm. Chef Michael Blackwell will make his famous mushroom soup and also a vegetarian and a non-vegetarian entrée. *Therefore, please contribute an appropriate appetizer, salad, bread, or dessert.* Please list the ingredients and species of any wild mushrooms in your dish. There will be a banquet permit, so you are welcome to bring your beer, wine, or the beverage of your choice.

We welcome your donations of new, old, or seldom-used mushroom-themed trinkets (also known as "tchotchkes") for a silent auction. All proceeds will go to the Ben Woo Scholarship Fund. Please bring your items to the banquet. We will also have door prizes. Raffle tickets will be available, with the prize an original framed photo taken by Machel Spence. The winner will be drawn at the end of the banquet.

There's a $5 per person fee to cover the facility rental and incidentals and to indicate how many will be attending. **You and your guests must be pre-registered to attend.** Although the room is larger, space will still be somewhat limited, so please sign up right away to avoid disappointment! You can conveniently sign up and pay on-line on the members' section of the PSMS website, or you can send a check, payable to PSMS, to our Treasurer John Goldman at 5819 SW Horton, Seattle, WA 98116. Payment must be received before March 11. Questions? Contact John at john.goldman@comcast.net. We look forward to seeing you on the 16th.

UPCOMING CLASSES — Danny Miller

The next couple of months are going to be busy in the education department. We have classes in beginning and intermediate mushroom ID, mushroom cooking (mycophagy), photography, and dyeing with mushrooms. There's something for everybody! Sign up for any of them at www.psms.org under "Education" in "Classes and Workshops" on our homepage.

PSMS Mycophagy Class (Beginners Mushroom Cooking), Tuesday, March 19, 7–9 pm, Douglas Classroom, CUH

This class, taught by PSMS member and chef Michael Blackwell, will consist of

- Sautéing fresh mushrooms
- Preparing dried mushrooms for cooking (reconstituting)
- Mushroom soups

This will be a lecture-style demonstration class. Students will get to sample the dishes that are prepared.

Class fee for PSMS members is $30. Class size is limited to 25 people so everybody can get a good view and personal attention.

There will be one hour for an introduction and lecture and one hour for demonstrating technique and familiarizing participants with edible varieties, details of cooking and sampling items cooked, wrap-up, and questions and answers. Fresh Agaricus, shiitake, oyster, and other varieties of small edible mushrooms along with dried morels and dried boletes will be used.

Myco-Photo Walk, Saturday, March 16, 9 am

Are you interested in taking better mushroom photos? Do you not know what all those settings are for on your camera? Do you have so much camera equipment that others won't go mushroom hunting with you, because you take too long to get down the trail?

No matter your experience with mushrooms and photography, you are welcome to join us for the beginning of a tradition. There are always mushrooms out, even if there are none to eat, so don't worry about not having any photographic subjects!

Led by Paul Hill, this walk will take place on Saturday, March 16, at 9 am at a Seattle park to be decided. *There is no charge* for this outing.

The day will begin with some technical discussion, then we'll break into smaller more intimate groups. The groups will disperse in the park to spend time trying some experiments and exercises to see what we can do with our cameras. In this day of digital photography, experimentation is the name of the game. We'll reconvene at the end of the day to review and discuss our efforts and even project for everyone to see any results we're willing to share. We'll break with enough time to head home for those who wish to clean up and dress for the Survivors' Banquet.

For more information see the "Event Description" on the sign-up page at www,psms.org.

Mushrooms for Dyes, with Alissa Allen, Wednesday, April 2, 6–9 pm, Douglas Classroom, CUH

Alissa Allen

In this hands-on workshop, participants will learn to harness the color-rich pigments found in local mushrooms. We will talk about mushroom identification and the use of mineral salts and pH modifiers to alter and enhance colors. Participants will take home a record of their dye experiments on note cards, using the wool we provide in class.

$45 for PSMS members, $60 for the public. Includes wool samples and supplies.

PSMS Beginning Mushroom ID Class Sunday April 7, 9 am–5 pm, CUH

For those of you who have been trying to get into a Beginner Mushroom ID class for a while, we are going to try and get everybody who has been patiently waiting into this class by holding it in the big meeting room at CUH and opening it up to 70 students. It will be an all day class on Sunday, April 7, 2013, from 9 am–5 pm. This class will cover all the topics that the four-class series covers but in an all-in-one-day format. This class will focus on skills for collecting, identification, hobbies, and toxins. Slides and live specimens will be used to familiarize the student with mushroom anatomy, biology, and other aspects of mushrooms. The fee for this class is $50.00.

The instructors will be Hildegard Hendrickson, Danny Miller, Daniel Winkler, and Larry Lee.

PSMS Intermediate Mushroom ID Class, Thursday nights, 7–9 pm, March 7–28, Douglas Classroom, CUH

Intermediate Mushroom Identification classes will focus on skills for identification of the most common genera of local wild mushrooms. Slides and live specimens when possible will be used to familiarize the student with mushroom anatomy, biology, and other aspects of PNW fungi. Classes meet on Thursdays in March 2013 from 7–9 pm in the Douglas Classroom of the UW Center for Urban Horticulture. The fee for this class series is $50.00. Class size: 40

Normal prerequisite: PSMS Beginner Mushroom ID class. The instructors will be Hildegard Hendrickson, Danny Miller, and Daniel Winkler.

MUSHROOM TEACHING STAMPS — Brian Luther

In 2012 the country of Estonia issued a single mushroom stamp showing *Amanita virosa* and warning people about this poisonous mushroom.

In 2012 Ghana issued a set of stamps entitled Toxic Mushrooms and providing "tips for identifying poisonous species." Poland has a 2012 set of both edible and poisonous mushrooms as well.

Many countries over the years have issued sets of poisonous fungi on postage stamps. Not only are these stamps very collectible, but they're intended to teach as well. Using postage as a medium for disseminating vital information is a really practical idea.

Here in North America we have a real problem of immigrants from SE Asia confusing their native edible Straw Mushroom (*Volvariella volvacea*) with *Amanita phalloides*, a deadly look-a-like, which is common in California and other states. It would be great to see a similar program using postage stamps for public health awareness here in the United States, focusing on some of the commonly encountered poisonous species.

B. Luther

In case you're interested, the neighboring countries of Latvia, Lithuania, and Belarus to the south of Estonia all have beautiful sets of mushroom stamps.

Estonian Amanita virosa *stamp, 2012.*

Alissa Allen

Planetary Disasters, *cont. from page 1*

food each year. Other major staple crops face similar threats, such as rice blast (*Magnaporthe oryzae*), corn smut (*Ustilago maydis*), soya bean rust (*Phakopsora pachyrhizi*), and wheat stem rust (*Puccinia graminis*). The stem-rust superstrain Ug99 has in recent years slashed yields in parts of Africa by as much as 80 percent.

If all five crop staples were hit with fungal outbreaks at the same time, more than 60 percent of the world's population could go hungry, says Gurr. "That's apocalyptic," but unlikely, she says—"more of a James Bond movie." David Hughes, a zoologist at Pennsylvania State University in University Park, adds that terrorists could use fungi to wreak havoc by targeting economically important crops. In the 1980s, for example, a possibly deliberate infection wiped out cacao crops in northern Brazil, changing the country's demographics and ecology as people moved from unproductive farms to the cities and cleared more rainforest. "If you wanted to destabilize the world, you could easily introduce rubber blight into southeast Asia," he says, which would trigger a chain reaction of economic and political effects.

Modern agriculture has exacerbated societies' vulnerability by encouraging farmers to plant the same strains of high-yield crops, limiting the variety of resistance genes among the plants, says Gurr. "We've skewed the arms race in favor of the pathogen," she says. "That's why we're on the brink of disaster."

Researchers estimate that there are 1.5 million to 5 million species of fungi in the world, but only 100,000 have been identified. Reports of new types of fungal infection in plants and animals have risen nearly tenfold since 1995 (Fisher et al., 2012). Gurr suggests that climate change might be a culprit.

Humans have cause for concern as well. In the past decade, a tropical fungus called *Cryptococcus gattii* has adapted to thrive in cooler climes and invaded the forests of North America's Pacific Northwest. By 2010, it had infected some 280 people, dozens of whom died. Although fungi are not spread as easily from person to person as viruses, for example, and anti-fungal agents can effectively tackle most infections, there are still reasons to worry. Fungi continue to evolve, and once they are established in an ecosystem, they can be almost impossible to wipe out.

Given these trends, experts say that fungi have not received enough attention from researchers and governments. "I'd be very surprised if an abrupt fungal infection killed a large swathe of people. But it's not impossible," says Matthew Fisher, an emerging-disease researcher at Imperial College London. "Complacency is not a recommended course of action."

PRESIDENT'S MESSAGE

Marian Maxwell

Saturday, March 16, is our Survivors' Banquet and annual business meeting, when we will present our newly elected board of Trustees and officers for 2013–2015. For more information and details about registering, go to the "Events" column on the PSMS homepage (www.psms.org) and select the "Survivor's Banquet" link. Sara Nelson, one of the owners of Fremont Brewing has again graciously offered to donate a keg of their fabulous beer to our banquet. Thank you, Sara and Fremont Brewing!!

We need volunteers for our banquet! Once you have registered for the banquet, you can go to "Event Registration" (under the "Events" column on the homepage). Select "Events" again on the next page and select "Volunteer to help at the banquet." If you wish to register to help with more than one item, make your first selection, and then click "continue" at the bottom of the page; the next page will then ask you if you want to add another attendee. Click to add an attendee but put in your own name again, and it will allow you to register for another volunteer position.

Remember that we are a non-profit organization that depends on our volunteers. For things to run smoothly we need people to step forward and help in some capacity. We are forming some new committees to try to provide a well rounded variety of interests for our members.

These new committees will be Treasury and Finance, Programs, Volunteer Co-ordination, Development for PSMS, Sustainability and Ecology, Culinary, Arts and Crafts, Photography, and Mushroom Maynia. If you have an interest in helping with one of these new committees or one of the existing committees (found on the website in the member's section) please contact me at president@psms.org.

We are seeking a PSMS member who would be willing to chair our annual Wild Mushroom Show. Our last show chair, Kim Traverse, has stepped down after successfully chairing this position for the past 5 years. Thank you, Kim! In order to have the preparations for this coming year's show go smoothly, we will need to find a chair soon. Please contact me if you are interested in this position!

Each and every one of you has an interest in contributing to our club. Everyone has different amounts of time that they can contribute, but all can volunteer some amount of time. Put your heart into it, and make this club be what you want it to be.

COFFEE FUNGUS FORCES GUATEMALA TO DECLARE STATE OF EMERGENCY

Nate Wooley

investorplace.com, Feb. 12, 2013

Coffee rust (*Hemileia vastatrix*) is devastating coffee growers in Guatemala.

Cofee leaf infected with coffee rust.

The Central American nation's president declared a state of emergency over the coffee rust infection, reports the Associated Press. President Otto Molina Perez says that more than 70 percent of Guatemala's coffee is harmed by the fungus.

Guatemala is the third Central American country to enact emergency measures to deal with the coffee blight. It also has been seen in El Salvador, Costa Rica, Panama, Mexico, and Honduras.

Otto Cabrera, an adviser with Anacafe, said coffee rust arrived in Guatemala in the 1980s. "The fungus directly affects coffee leaves, initially with yellow spots that later turn orange and reaches around the foliage of coffee, then makes the leaves fall," he said. "The plant loses its foliage. It's not able to breathe, so it ceases producing and it eventually dies."

More than 100,000 workers in Guatemala already have lost their jobs. With more than 1.2 million jobs in the coffee industry, Guatemala is freeing up $14 million to help coffee growers to purchase pesticides and to provide education to planters about how to avoid and treat the fungus when it appears on their crops.

Officials from El Salvador, Panama, Guatemala, Honduras, and Costa Rica are planning a joint meeting in Honduras at the end of February to determine ways to work together to fight the fungus.

FREE LECTURE BY PAUL STAMETS

Solutions from Underground:
How Mushrooms Can Heal the Planet

120 Kane Hall, UW Campus, Fri., May 10, 2013, 7 pm

Paul Stamets

Our biosphere is quickly changing, eroding life support systems that have allowed humans to thrive for thousands of years. Unless we make a course correction in the very near future, species diversity will continue to plummet, with humans being not only the primary cause, but one of the victims. Paul Stamets is a ground-breaking mycologist whose research demonstrates how fungi can help with oil clean up, habitat restoration, insect control, and the treatment of smallpox. In this talk he discusses how our close evolutionary relationship to fungi can be the basis for better health for ourselves and a sustainable future for our planet.

PSMS member Paul Stamets was named one of Utne Reader's "50 Visionaries Who Are Changing Your World." He received the President's Award from the Society for Ecological Restoration, is the recipient of the "Bioneers Award" from The Collective Heritage Institute as well as the "Founder of a New Northwest Award" from the Pacific Rim Association of Resource Conservation and Development Councils. In 2012 he received an honorary Doctorate of Science (D.Sc.) degree from the accredited National College for Natural Medicine, Portland, Oregon. *Paul Stamets on 6 Ways Mushrooms Can Save the World* is one of the highest ranked TED [Technology, Entertainment, Design] talks ever.

Attendance is by registration, and you can reserve four tickets. To register, go to

http://www.burkemuseum.org/events/browse/solutions_from_underground

SERBIA WITHDRAWS SUSPECTED TOXIC MILK

AP, Feb. 20, 2013

BELGRADE, Serbia - Serbian officials ordered 50 types of milk, produced by nearly all dairies in Serbia, taken off store shelves Wednesday because they were dangerously contaminated with aflatoxin linked to mildewed cattle feed. Aflatoxin is produced by many species of the fungus *Aspergillus* and can cause cancer if consumed in high doses. An extremely dry summer last year provided conditions for the poisonous mold to grow, mostly in corn that is used as animal feed.

The order came after widespread public outrage over allegations that health authorities have for weeks been hiding the results of lab tests which reportedly show that much of the milk sold in Serbia contains high levels of aflatoxins. Suspicions of a government cover-up are fed by the region's widespread corruption and the cozy ties between politicians and industry.

Goran Jesic, an agriculture official who broke the silence and published the results of the aflatoxin tests on Tuesday, demanded on Wednesday that the government also withdraw the cattle feed and instruct the farmers how to neutralize the presence of aflatoxins.

Ljubisa Jovanovic, on the other hand, who runs a large dairy farm Belgrade, maintained, "When it comes to health effects, the milk is absolutely safe to consume, and the issue at hand concerns only the raising of standards of quality of the milk."

The alarm was first sounded in the region several days previously after routine veterinary tests during a Bosnia border inspection revealed high toxin levels in milk imported from Croatia.

Since then, four brands of milk have been withdrawn in Croatia because of aflatoxin contamination. High levels of the toxin have also been found in some samples of milk sold in Slovenia, Bosnia, and Macedonia.

NO. 3 LONDON DRY GIN FIGHTS FOR JUNIPER CONSERVATION

Carol Emmas
Harpers Magazine, Feb. 2013

No. 3 London Dry Gin has joined forces with wild plant charity Plantlife to help boost its juniper conservation efforts on the back of disease threats.

British wild juniper bushes face a threat from the fungus-like disease *Phytophthora austrocedrae*, which is reported to be spreading nationwide.

The brand has offered three £1,000 grants, aimed at site managers and landowners of existing juniper sites who wish to improve their habitat for juniper and encourage natural regeneration.

All gins feature juniper, but No. 3 uses the fruit "robustly" and is complemented by just five other fruits and spices. It was created three years ago by Berry Bros & Rudd to "taste as gin should," without the use of an excessive amount of ingredients that characterise many modern gins

Tim Wilkins, species recovery coordinator at Plantlife, said: "Juniper has been steadily declining over the past few decades and without action now, it actually faces extinction across much of lowland England within 50 years. That would represent more than the loss of a single plant type—it supports more than 40 species of insects and fungi that just cannot survive without it. Plantlife has launched various juniper conservation projects across the UK but, especially with this new fungus threat, we're absolutely thrilled that No. 3 is bolstering our efforts in these ways."

IOWA MUSHROOM CERTIFICATION

Oskaloosa News, Feb. 20, 2013

To legally sell morels in Iowa, mushroom hunters need to complete a morel mushroom certification workshop being offered by the Iowa State University Extension and Outreach at several Iowa locations in March and April.

"The aim of the workshop is to help assure that misidentified mushrooms are not sold as morels," said plant pathology professor Mark Gleason. "To meet the need for this training, we are offering a three-hour certification workshop on identifying morels and false morels."

There's a small minority who will call 999 [911 in U.S.] *at the drop of a hat. A Liverpool man phoned to complain that a takeaway company had put mushrooms on his pizza, even though he hated them. He wanted the police to demand that the pizza restaurant remove the offending vegetable and give the owners a caution.*

—Express.co.uk, 2/21/2013

BORN OF THUNDER, NURTURED BY RAIN—OVER 30 VARIETIES OF TRUFFLES FOUND IN THE DESERT

Claudia Farkas Al Rashoud

Arab Times, Feb. 16, 2013

Brought to life by flashes of lightning and claps of thunder, and nurtured by early seasonal rainfall, the desert truffle is a gastronomic treasure that lies hidden beneath sandy soil in undisturbed landscapes. Highly prized by the pharaohs, relished by ancient Greeks and Romans, and still much sought-after today, desert truffles, known as fugga in the local dialect, are sold in ramshackle sheds at the back of the Friday Market just off of Fourth Ring Road.

The truffle vendors need no prompting to talk about their wares. "You want to know all about truffles? I will tell you," says Abu Abbas. "The truffle season begins the middle of November and ends the middle of May. Truffles will only grow if there is rain during the wasm season, which in Kuwait is from the middle of October to the middle of November, and there must also be electrical storms. The truffles emerge 76 days after the first rains have fallen.

"The first truffles come from Algeria, because their rainy season begins early, in September. After that come truffles from Morocco, Tunisia, and Egypt. At the end of January, you have truffles from Saudi Arabia, Iran, Iraq, and Kuwait, and later on there are truffles from Syria."

The question of whether truffles actually still grow in Kuwait is a point of contention in the truffle market. "Kuwaiti truffles? There haven't been any in years," says one of the vendors.

"He's right," says an old Kuwaiti gentleman passing by. "The desert has been spoiled by all the campers with their cars and buggies, so nothing grows there any more."

Another vendor claims there are truffles to be found in remote areas of Kuwait, where motor vehicles have not severely compacted the soil. Other vendors agree, citing fenced off security and oil production areas, and even the sands surrounding Kuwait International Airport runways, as places where truffles still grow.

During this visit to the truffle market early in the season, the truffles are all from Algeria, with the smaller ones selling for KWD 4 a kilo [1 Kuwaiti dinar = ~ US $3.50] and the biggest ones priced at a kilo for KWD 8. The smallest are a bit larger than a Ping-Pong ball while the largest are about the size of a man's fist. They resemble gnarled, irregular-shaped potatoes with lobes.

A Kuwaiti lady bargains for a basket of medium-sized truffles, carefully examining them to make sure they are firm and fresh. When questioned, she discloses her recipe for preparing these desert delicacies.

"First you have to wash the truffles several times as they are full of sand. Then you boil them until tender, and at this stage I slice and wash them again, to make sure all the sand is removed. Then I dry them off and fry them in clarified sheep fat called dehen adani, along with finely chopped onions, cumin, black pepper, and the dried black limes known as loumi aswad, and serve them along with rice. We like to eat them like this with our traditional dish called machbous, which can be made with meat or chicken. You can also just boil the truffles and then fry them in butter, like regular mushrooms. I made them this way for my family the other day and they really enjoyed them."

Desert truffles are also used in local traditional medicine and are said to be good for treating eye, back, and leg problems. "To make a cleansing and soothing eye wash, cut and wash the truffles thoroughly, then boil them and keep the water. When it has cooled off, put some of the water in a dropper and put a few drops into the affected eye," instructs Abu Abbas.

Another vendor advises eating lots of truffles to strengthen the body, claiming this food is particularly beneficial for those with back, knee, or leg ailments.

There are hundreds of species of truffles. Desert truffles are the relatives of European truffles, which are more rare, have a stronger aroma, and are infinitely more expensive. The price of black truffles sold by a retail seller in France several years ago is listed as 3,940 euros per kilo, the equivalent of more than KWD 1,462. European white truffles fetch equally astronomical sums. The record price for a single white truffle was set in 2007 when Macau casino owner Stanley Ho paid $330,000 (around KWD 92,814) for an Italian specimen weighing 1.5 kilos. At such extravagant cost it's no wonder that European truffles are served very sparingly, often finely shaved into paper-thin slivers.

The fabulous reputation of the European truffle, however, should not detract from the merits of its cheaper cousin. Desert truffles were enjoyed by the great gourmets of the ancient world, the Romans, who cooked up mass quantities obtained from their colonies in Lesbos and Carthage. The first written mention of desert truffles dates much further back into the mists of time, with the neo-Sumerians noting the truffle-eating habits of their enemies, the Amorites, who belonged to the Third Dynasty of Ur, 20th century BCE. Papyrus writings tell us that desert truffles were popular with the pharaohs, while some three thousand years later they turned up on the tables of the Fatimid caliphs in Cairo.

Desert truffles, of which there are more than thirty varieties, have been found in a wide range of arid and semi-arid zones including the Kalahari and the Sahara Deserts, the Mediterranean basin, the Arabian Peninsula, Iraq, Iran, parts of Eastern Europe and China. They belong to the *Terfezia* or *Tirmania* genera, and can be brown, black, creamy white, or sometimes pink.

Much information on Kuwaiti desert truffles can be found in the writings of Dame Violet Dickson and her husband, the British Political Agent, Colonel Harold Dickson. The couple came to Kuwait in 1929 and during their many years in the country they chronicled Kuwait's history, natural history, and desert traditions. Dame Violet wrote a book called *The Wild Flowers of Kuwait and Bahrain* in which she describes the local desert fungi.

Writing about the zubaidi or white fugga (*Tirmania*) she says, "This truffle is found in great quantities in the Dibdibba, some 100 miles west of Kuwait, when the rainfall has been good... (The truffles) are associated with a plant known as 'Rug-rug' (*Helianthemum lippi*). They are looked upon as a great delicacy, and are sold in the Bazaars. These truffles are also found in Kuwait nearer the town, but they never attain the size of those found further west."

According to Dame Violet, the khalas or brown fugga (*Terfezia*) is smaller and not such good eating as the white zubaidi variety. In her day it was found all over Kuwait, together with the White Fugga. "Before they are fully grown they only crack the earth very slightly and are difficult to locate, but as they grow larger they push up quite a mound of earth. A truffle of say, three inches across, will make a mound at least 12 inches across. They are usually 4–6 inches deep in the ground... The Arabs say when they locate one truffle that her 'walad am,' or cousin, must be close by."

Dame Violet mentions one more type of desert truffle called Haberi or "Birds Fugga." "They are small and usually four or five grow together. The largest I have seen is barely an inch in diameter, but more often they are no bigger than peas. They are eaten raw by all Badawin children. The migrating birds discover them and peck them out of the ground, as they do not grow deep down."

Dame Violet also states that unless the wasm rains are accompanied by thunder and lightning, truffles will not grow. This association between the germination of desert truffles and electrical storms was already noted in the first century AD by the Greek philosopher Plutarch and the Roman poet Juvenal, who thought that truffles were engendered by thunder, lightning, and rain.

In her book, *Forty Years in Kuwait*, Dame Violet also provides an interesting account of a truffle-hunting expedition that took place in February 1968 following a season of abundant rainfall. On a bitterly cold morning she and her Bedouin friends set off to the Dibdibba region of the desert, where they found many tents and many of the Rug-Rug plants which live in symbiosis with the truffles.

"On our first search for the truffles, Nasser, who has eyes like a hawk, immediately discovered a large white one (zubaidi), and later dug out many of the smaller brown ones…On the fourth day we went back to town with twenty kilos of truffles, more than 120 Pounds Sterling worth, at the prevailing market price, for this much-prized delicacy."

Three weeks later, Dame Violet and her friends returned to the same area. By this time it was warmer and the desert was carpeted with wildflowers. "With my three companions I searched daily from early morning to nearly noon, and then again in the afternoon. (At mid-day, with the sun overhead, the small tell-tale cracks in the surface which mark the presence of a truffle have no shadow in them, and are difficult to detect.)

"The weather was perfect, and each evening we boiled up enough truffles for our own supper. It was a wonderful time, as this harvest of truffles gladdened the hearts of all the badu, and in our own party, as well as among the others we met, there was an air of happy excitement."

After five days the truffle-hunting party returned to Kuwait town with about 150 kilos of large white zubaidi truffles, which Dame Violet divided between herself and her companions, giving many away to neighbors and friends. The Bedouins told her it was the best truffle season they'd seen in thirty years. In his fascinating, detailed book on local Bedouin life, *The Arab of the Desert*, Colonel Harold Dickson also wrote of the significance of the desert truffle. "If rain falls in October, truffles and mushrooms, great delicacies to every Badawin, appear in the following spring, and form the staple food of the tent-dweller and his family for weeks on end. Truffles with hubara (a game bird) are verily, like the manna of old, Allah's reward to those who have endured the summer heat."

Vendors display truffles stacked in their stalls.

In modern Kuwait, despite the vast variety of different foods available and the proliferation of restaurants, the gnarled and wrinkled desert truffle is still much in demand. Perhaps part of its attraction has to do with nostalgia for simpler times. After all, the desert truffle is evocative of the days when the spring air was scented with the sweet smell of wildflowers and Kuwaiti families in their seasonal camps could spend peaceful and enjoyable hours together hunting for fugga.

VOLUNTEER OPPORTUNITIES **Debra Lehrberger**

Survivors' Banquet: Once you are signed up to attend this year's Survivors' Banquet, we have several new opportunities to get involved and be a part of the wonderful camaraderie. Simply go to www.psms.org, log in to the Members' Page, click on "Event Registration," and then click on "Volunteer at Survivors' Banquet—March 16th Saturday." Looking forward to seeing you there!

Field Trips: Call for volunteer field trip hosts for this Spring's incredibly awesome schedule of field trips. Come be a part of the group that serves our members, meet and greet so many absolutely lovely and interesting field trip attendees, and be a part of what makes PSMS so extraordinary—our volunteers. Contact me at Host@psms.org for a list of what is available.

PIRATE FLIES HAVE SYMBIOTIC RELATIONSHIP WITH FUNGUS **Brett Smith**

redOrbit.com, Feb. 6, 2013

By studying tiny flies, biologist Jeffrey Joy, from Simon Fraser University located just outside of Vancouver, Canada, was able to gain insight not only into a symbiotic relationship the flies have with a fungus but also into how evolutionary pressures have allowed the flies to exploit this relationship to the benefit of their species.

According to Joy's paper in the *Proceedings of the Royal Society of London Series B*, two categories of gall-inducing flies—*Diptera* and Cecidomyiidae—are examples of how prolific diversity can be a characteristic of symbiotic relationships.

In his report, Joy noted one group of flies was in a symbiotic relationship with a fungus called *Botryosphaeria*. Another, much larger group used as an experimental control had no relationship with the fungus. While scientists are uncertain how the symbiotic relationship began, Joy said his genetic analysis suggests the relationship has evolved at least four different times since its inception.

The relationship involves the flies picking up the fungi, storing them on their bodies, and depositing them onto plants. There, the fungi convert plant tissue into a gall, or tumor-like structure, that can be more readily utilized as food.

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Pirate Flies, *cont. from page 7*

"The flies are like pirates," Joy explained in a statement. "They use the fungi as boats to float across a genomic sea and board a plant that is genetically far removed from what they would otherwise be able to feed on."

Because the fungi can feed on a wide array of plant material, they enable the flies to have a more expansive diet. This conclusion suggests symbiosis can enhance diversity as much as competition and predation.

"Symbiotic lineages of these flies have undergone a more than seven-fold expansion in the range of plants they can feed on relative to the lineages without such fungal symbionts," Joy said. "Also, one genus of gall-inducing flies utilizing fungal symbionts is 50 percent more diverse than its brethren without the symbiotic relationship."

Joy noted his study was able to not only describe a symbiotic relationship, but also shed some light on the evolutionary activities occurring throughout the relationship and the benefits this evolution conveys.

"The goal of this work was to test predictions of evolutionary theories of diversification and symbiosis," Joy said. "The theory I observed in action is that the evolution of symbiosis catalyzes niche expansion—an organism's use of more resources—and diversification—increased species in lineages.

"These findings expand our understanding of how biological diversity is generated and how processes such as symbiosis lead to some remarkable examples of biology, such as the symbiotic mutualism between clownfish and sea anemone," he added.

Jeffrey Joy / SFU Public Affairs and Media Relations

Fly in pupal stage seen feeding on vegetative matter in fungus lining plant gall created by fly.

Joy's latest study expands on his previous work, which was also published in the *Proceedings of the Royal Society of London Series B*. That earlier work, performed under SFU biologist Bernard Crespi, discussed the diversity among plant-feeding insects.

Currently a post-doctoral researcher at SFU, Joy's work "integrates genetic, population genetic, phylogenetic, ecological and comparative approaches to study unresolved evolutionary questions in disparate groups of organisms across the tree of life."

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