

The Potomac Sporophore

Winter | February 2018

Volume No. 33 | Issue No. 1

The quarterly publication of the Mycological Association of Washington, Inc. (MAW) | <http://mawdc.org>

In This Issue:

Mushroom Nutrition	1
Mapping Mushrooms	1, 6
Meeting Files	4
Upcoming Events	4
Recipe	5
In the News	7
Cartoon	8

The Mushroom Chronicles: Edible Fungi and Nutrition

William Needham
MAW President

Mushrooms or more generally fungi are neither plant nor animal; they do not synthesize their own food from the energy of the sun and they are not mobile. They are somewhat in between, though closer to animals according to their DNA. Some fungi are edible and others are toxic, like some wild plants and to lesser extent animals. However, the toxicity of some wild plants does not militate against the consumption of those that are recognized as edible. Wild mushrooms, on the other hand, are considered by most Americans to be poisonous toadstools. And as if this were not enough, it is generally (but erroneously) believed that fungi have no nutritional value. So

why would anyone want to eat them? The first reason is a gustatory matter; those who have tried wild fungi find them not only edible, but in some cases quite palatable. The second reason is a nutritional matter, also a reflection of what fungi are made of; they are relatively high in proteins and minerals. The fact is that there are many identifiable wild fungi that merit consideration as viable food alternatives to the plebeian meat and potatoes.

The consumption of edible fungi, though certainly of ancient origin, is not well documented in the historical record. Fungi were first used for medicinal and supernatural purposes. The earliest known archaeological depictions of mushroom-like images are rock markings in the Tassilli Caves of the Sahara



Thomas Roehl

We eat mushrooms because they are tasty, but how good are they for us?

Desert that are about 7,000 years old. The dancing figures carrying mushroom-shaped objects are postulated to be members of a cult engaging in ritualistic activity. The Neolithic Ötzi was found after some 5,000 years of being frozen in ice in the Italian Alps with several pieces of Birch Polypore (*Piptoporus betulinus*) on a thong

Continued on Page 2

One Yard, One Year, 499 Mushrooms

Thomas Roehl
MAW Newsletter Editor

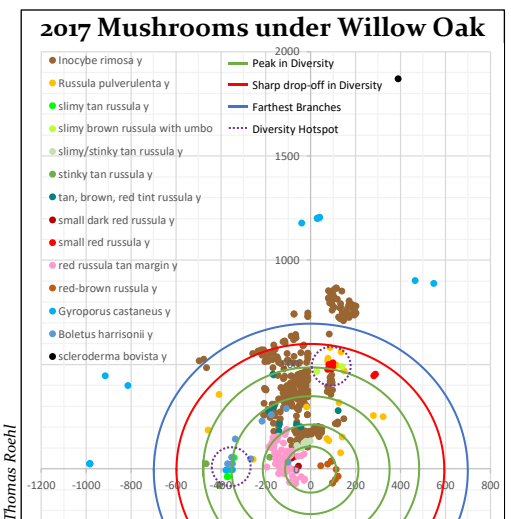
In October of 2016, I stepped out into my back yard and found it carpeted with medium-sized brown mushrooms. Apparently, I had nothing better to do that day than attempt to identify these boring nondescript mushrooms, so I sat down with a field guide and managed to key them out to *Inocybe rimosa*.

This was a surprising result; *Inocybe* is a mycorrhizal genus, meaning it grows in partnership with plants. Most of the boring brown mushrooms that pop up in yards are saprobic, meaning they decompose dead plant matter. The only plant in my

yard that grows with mycorrhizal mushrooms is a willow oak (*Quercus phellos*), so there is a very limited area where *I. rimosa* can grow. This made me wonder, "Will it grow in the same place next year?" There was only one way to answer that question: keep track of where mushrooms appear in my yard. I logged all 227 *I. rimosa* mushrooms and waited for 2017, when I would map all the mycorrhizal mushrooms that appeared in my yard.

General Observations

When you look at the 2017 map, the first thing you notice is that areas tend to be dominated by a single mushroom



Thomas Roehl

species. *I. rimosa* and the red *Russula* with a tan margin are the best examples of this. Few other species appear inside the areas dominated by those two mushrooms and there

Continued on Page 6

Science

Continued from Page 1 around his neck, likely for the treatment of intestinal worms and not for nutrition. Ancient Egyptian hieroglyphics suggest that mushrooms were thought to convey immortality, their use therefore restricted to the apotheosized pharaoh and his entourage. In ancient Greece in the city of Eleusis, the Temple of Demeter (the Goddess of Fertility) was the destination for pilgrims including Aristotle, Plato and Sophocles who participated in a yearly ceremony that involved the consumption of ambrosia that is thought to have been made from mushrooms. The resultant "Eleusinian Mysteries" forever changed the participants in a manner that was never formally recorded, but was presumably hallucinogenic in nature. In Russia, eating mushrooms was believed to yield superhuman strength.

It is not known when the consumption of mushrooms (mycophagy) for nutrition began, though speculation is that trial and error during the "hunter-gatherer" epoch of human prehistory eventually led to the identification of those that were and were not edible. However, through cultural isolation different

regions became either mycophilic or mycophobic, according to the ethnomycological theories of Gordon Wasson. The mycophobia of Anglo-Saxons is legendary; the noted herbalist John Gerard writing in his seminal *Herball or Generall Historie of Plantes* in 1597 that "Most of them do suffocate and strangle the eater." Venner, a British writer of the 17th Century, was a bit subtler: "Many phantasticall (sic) people doe greatly delight to eat the earthy excrescences called Mushrooms (sic). They are convenient for no season, age, or temperament." On the contrary, continental Europeans were and are mostly mycophilic, as were the Native Americans. Vincent Marteka in "Mushrooms Wild and Edible" contends that mushrooms were a staple of Native American cuisine and that the Iroquois "ranked the pleasure of eating wild mushrooms as virtually equal to that of eating meat." This practice was not transferred to the colonists; the predominant British view that mushrooms were anathema had an overriding effect.

While plants consist of cellulose and lignin, fungi have a cell structure that is comprised primarily of chitin.



Thanks to Ötzi, we know that people used to eat *Piptoporus betulinus*. However, that was probably for its medicinal benefits. Top: *P. betulinus* in nature. Bottom: Ötzi's *P. betulinus* chunks.

Chitin is the material that makes up the exoskeletons of insects and crustaceans; the chitinous structure of fungi imparts a texture and firmness that is reminiscent of meat. Chitin is a non-soluble protein that forms an amino polysaccharide molecule that is highly polarized; the distribution of atoms results in high concentrations of positive and negative charge at separated points on the molecule. The positively charged region forms ionic bonds with lipids (fats and similar substances) and bile, resulting in a large polymer compound that cannot be digested and is excreted from the body. Bile is produced by the liver to aid in the digestive process; its loss must be made up for with new bile, a process that uses cholesterol. A 1994 study found that chitosan (a form of chitin) consumption reduced body fat by 8 percent over a four-week period and reduced cholesterol by 32 percent over a five-week period. The reduction in fats and cholesterol contributes to cardiac health and thus to longevity. This has long been recognized by the Chinese, who consume mushrooms as a matter of health rather than nutrition.

In addition to chitin, fungi are also an excellent source of protein, which is necessary for the growth of human body cells. The protein content of commercially grown edible mushrooms ranges from a high of 35 percent of dry weight (White or Button Mushroom,

MAW Board of Directors

President

William Needham
(202) 251-8430
president@mawdc.org

First Vice President

John Harper
(202) 257-7167
vicepresident@mawdc.org

Second Vice President

Mitch Fournet
(301) 768-6788
vicepresident2@mawdc.org

Programs

Connie Durnan
(202) 362-1420
programs@mawdc.org

Membership

Tom McCoy
(301) 785-2705
membership@mawdc.org

NAMA Liaison

Bruce Boyer
(703) 863-9633
namatruster@mawdc.org

Treasurer

Elizabeth Hargrave
treasurer@mawdc.org

Secretary

Agnes Demianski
secretary@mawdc.org

Newsletter

Thomas Roehl
newsletter@mawdc.org

Forays

Jared Urchek
forays@mawdc.org

Culinary

Michael Dong
culinary@mawdc.org

Science Advisor

Shannon Nix

Views expressed within these pages represent the individual authors and not necessarily MAW or its board of directors. MAW is a member club of the North American Mycological Association (NAMA).



Thomas Roehl

Agaricus bisporus is the most common edible mushroom. It has a relatively high protein content and a potassium content that rivals that of bananas

Agaricus bisporus) to a low of 4 percent (Tree-Ear *Auricularia auricula*). This compares to 25 percent for milk, 39 percent for soybeans, and 13 percent for wheat. Thus, mushrooms have more protein than most other foods. Of equal importance to the amount of protein is the quality of the protein, as determined by the relative concentration of the amino acids from which they are constituted. Eight amino acids are considered essential, as they cannot be synthesized by humans and must be obtained from other sources. For a food to be a good source of protein it must have all of the essential amino acids; any deficiency in one results in a reduction in the synthesis of the other seven. This is the fundamental argument of the balanced diet prescription. Consuming foods that are low in the essential amino acid lysine, such as grains like wheat and rice, must be balanced with foods that are high in lysine, like mushrooms. In fact, all eight of the essential amino acids are contained in the most popular commercial mushrooms, including button mushrooms, oyster mushrooms (*Pleurotus* spp.) and Shiitakes (*Lentinula edodes*). In *Mushrooms, Cultivation, Nutritional Value, Medicinal Effect, and Environmental Impact*, Chang and Miles rank foods according to their essential amino acids according to adult dietary requirements in a quantitative index on a scale of 0 to 100. Mushrooms (98) rank just below meat (100) and milk (99), but well above spinach (76), and tomatoes (44).

Fungi have several other noteworthy nutritional attributes: they are rich in a number of important vitamins and minerals, they have low

saturated fat, and they are low in calories. They are the best non-animal source of vitamin D and have relatively high levels of the vitamins niacin, thiamin (B₁) and riboflavin (B₂). Since one of the functions of fungi in mycorrhizal relationships with plants is the uptake of minerals, their high mineral content is not unexpected. Up to 70 per cent of the ash content of mushrooms consists of minerals, notably potassium. One medium sized Portabella mushroom (also *Agaricus bisporus*, the button mushroom) has more potassium than a banana of equivalent weight and about twice as much as an equivalent weight of whole milk. The fat content of commercial mushrooms averages about 0.4 percent; of this, 72 percent are unsaturated or "good" fat that promotes HDL cholesterol. Animal fat is saturated or "bad" fat that abets LDL cholesterol. The most significant contribution to mushroom unsaturated fat is linolenic acid, one of the Omega 6 essential fatty acids. The caloric impact of mushroom consumption is nominal; 100 grams of mushrooms have about 4 calories.

While nutritional values have only been determined for fungi that are sold commercially, the similarity in the protein and vitamin content of the different cultivated types suggests that wild fungi would have similar levels. There are several readily identifiable wild mushrooms that offer unique flavor in addition to the nutritional attributes delineated above. For example, Chicken of the Woods – *Laetiporus sulphureus* – is aptly named,



Thomas Roehl

Oyster mushrooms like the cultivated ones pictured on the left are a good source of amino acids. Many wild mushrooms, like the Chicken of the Woods on the right, haven't been studied to the same extent as cultivated ones, but they probably have similar nutritional values.

as it looks like, cooks like and tastes like chicken; its distinctive sulfur orange coloring is mnemonically represented in the species name *sulphureus*. Chanterelles are readily identified by their yellow horn-shaped fruiting bodies; the genus name *Cantharellus* is from the Greek *kantharos* which means drinking vessel, the flagons of history being made in the shape of a horn. Puffballs range in size from a few centimeters to half a meter in diameter; their smooth, white, rounded exterior facilitates identification. The genus name for large puffballs is *Calvatia*, from the Latin *calva*, meaning bald, also an appropriate mnemonic. Small puffballs are in the genus *Lycoperdon*, which translates somewhat loosely as "wolf passing wind," a reminder that a puffball must be harvested when young. Otherwise, the soft, creamy interior turns into spores that puff out a hole in the top, the result calling to mind the namesake canine bodily function.

It is a matter of record that the fast-food oriented American cultural diet has resulted in a host of weight and nutrition related maladies, among them diabetes and obesity. This is particularly troubling as it has now become apparent that children are increasingly at risk. The purveyors of children's programming once addressed the need to promote healthy eating with Popeye, a can of spinach providing him the strength to overcome everything from ogres to crocodiles. It may be time for a fungal variant to stimulate better nutrition; an Italian sailor named Luigi Crimini and his ladylove Portia Bella? 🍄



Events

Meeting Files

Thomas Roehl
MAW Newsletter Editor

November 7, 2017: Elinoar Shavit Introduces Desert Truffles

On November 7, Elinoar Shavit gave an entertaining talk on the history, uses, and ecology of desert truffles found in Northern Africa and the Middle East.

Elinoar is widely recognized as the leading expert on desert truffles. This came as a bit of a shock to Elinoar, who has only been studying desert truffles since 2007, when Tom Volk asked her to contribute an article to his Fungus of the Month website. At that time, Elinoar discovered that nobody else was

researching desert truffles, so she decided to do some research of her own.

She began her research by looking into the recorded history of desert truffles and examining the etymology of names for truffles. Amazingly, Elinoar found that Hebrew, Arabic, and other related languages all use essentially the same names: “gibbi” and “cama.”

This points to the fact that desert truffles have been important to the inhabitants of North Africa and the Middle East since ancient times. Elinoar even found stories involving desert truffles written in cuneiform – one of the world’s earliest written languages. References to desert truffles also appear in the Talmud and the Bible (Old Testament).

There are two important desert



Elinoar Shavit answers questions from MAW members after her talk on desert truffles

truffles: *Terfezia boudieri* (gibbi) and *Tirmania nivea* (cama). Both are mycorrhizal with *Helianthemum* shrubs and grow at or below the surface of the ground. *T. boudieri* is considered inferior because it collects a lot of sand and therefore requires a lot of cleaning before it can be eaten.

Both species are important staple foods for Bedouin people today because they appear after winter food stores have been used up and before the next planting season. Additionally, truffles are also used to treat eye infections and itchiness. 🍄

December 5, 2017: Lynnaun Johnson Shares the Secrets of Ghost Orchids

At the December 5 meeting, PhD Candidate Lynnaun Johnson explained his research into ghost orchids. Ghost orchids are well-known for their rarity and there’s a reason for that: in the United States, the ghost orchids grow only in baldcypress swamps in Florida on pond apple and pop ash trees. Additionally, the orchid’s range is decreasing due to habitat loss.

To help conserve the ghost orchids, Lynnaun is trying to understand how fungi help the orchids grow. Ghost orchids are fully mycoheterotrophic. This means they get almost all of their food from mycorrhizas (relationships where fungi grow in the orchids’ roots).

Lynnaun’s research examines three aspects of ghost orchid mycorrhizas: 1) how they differ from mycorrhizas of partially mycoheterotrophic orchids, 2) what fungi form these mycorrhizas,

Upcoming Events

The events listed below may change due to weather, speaker availability, etc., so read MAW emails and check our website at <http://mawdc.org> for up-to-date information on events. Exact foray dates and locations will be set closer to the event in order to take weather conditions into account.

Upcoming Events

Mar 6 **Monthly Meeting** featuring a presentation on mushroom cultivation by MAW Foray Chair **Jared Urchek** and MAW member **Danny Barizo**.

Apr 3 **Monthly Meeting** featuring a presentation by MAW member **Albert Casciero** on the mushroom culture of Spain.

Early April: **Morel Forays** begin – look for announcements by email!

May 8 **Monthly Meeting** featuring **Matt Nelson** speaking on lichens.

May 19 **Spring Culinary Event** at Sandy Spring Museum. More details will be provided through email and at monthly meetings. Sign up early because this event usually sells out!

Save the Date

Aug 26 **Mushroom Fair** at Brookside Gardens

Sep 22-23 **Annual Camp Sequanota Foray**

Nov 3 **Fall Culinary Event**

Unless otherwise noted, monthly meetings will be held on the first Tuesday of the month at 7:00 PM in the **Kensington Park Library, 4201 Knowles Avenue, Kensington, MD**. Attendees are encouraged to bring mushrooms for sharing and identification. Members of the public are welcome to drop in.

Special thanks to MAW member Ray LaSala for proofreading this newsletter!



Lynnaun Johnson presents his research on the interactions between fungi and the ghost orchid during the December meeting.

and 3) where the fungi get their energy.

After analyzing over 413,000 DNA sequences extracted from ghost orchid roots, Lynnaun found that the number of fungi in the roots of the ghost orchid was no different than the numbers in orchids that make their own food. However, the composition of the ghost orchid's fungal symbionts set it apart: 90% of the mycorrhizal fungi belonged to the genus *Ceratobasidium*.

Lynnaun also used carbon isotopes to examine the orchid's food sources. He found that ghost orchids rely on fungi for most of their food, even more than most fully mycoheterotrophic orchids.

This research will help scientists understand what the ghost orchid needs to thrive. With this knowledge, conservationists may be able to support the orchids in the wild as well as keep them alive in

Chaga Wine

This recipe from Jared Urchek won second place at last spring's culinary event.

Ingredients

5 gallons of fresh water

10-12.5 lbs sugar

1¼ cup Ground Chaga (1tbs per quart)

~ ¼-½ cup of whole spice bush berries (fresh or frozen, not dried)

1 cup of lemon juice

One packet of brewing yeast of choice (I use champagne yeast)

Directions

1. Directions: Mix Chaga powder with water, and bring to a boil, and let simmer for 1 hour (brings out the best medicinal qualities of the Chaga). Add the spice bush berries and lemon juice for the last fifteen minutes of the simmer.
2. Add in 2lbs of sugar per gallon for a dry wine, 3lbs sugar per gallon for a sweet wine. Stir well, then quickly cool down (either with a wort chiller, or other low-tech methods). Begin proofing the yeast (waking up the yeast in a roughly 1 cup of the cooled wort) and once the wort is ~100°F, or at least not hot to the touch, add in the yeast which should be frothy and bubbling once woken up (takes about five to ten minutes).
3. Let ferment in a large carboy or brewing bucket for a month or so with an airlock or a lid that is just loose enough for the CO₂ to escape without blowing up your bottle. Re-rack into a fresh bucket or carboy and let it finish fermenting (another 1 month or so, until it stops actively releasing CO₂).

the lab before returning them to their natural environment. 🍄

February 6, 2018: William Needham's Overview of the History of Psilocybin Use

During the first monthly meeting of 2018, MAW President William Needham took the audience through the history of the use of hallucinogenic mushrooms, from prehistory to 2017.

Hallucinogenic mushrooms primarily come from the genus *Psilocybe* and are mostly thin-fleshed little brown mushrooms. Mushrooms have been used for their mind-altering properties since before recorded history. *Psilocybe* mushrooms were first used by the Mayans in religious ceremonies. It took western science until 1957 to "discover" these traditions, when Gordon Wasson went to Mexico and then wrote about them in *Life*.

Timothy Leary read Wasson's article and went to Mexico to find the mushrooms. Upon his return, he began using the mushrooms in psychology experiments. Albert Hoffman later synthesized the hallucinogenic compounds from the *Psilocybe* mushrooms, naming the two critical compounds "psilocybin" and "psilocin."

During the 60's, Leary's efforts popularized the mushrooms and other hallucinogens like LSD within the hippie counterculture. The growing popularity of hallucinogens let

Congress to introduce the Controlled Substance Act, where LSD, psilocybin, and marijuana were classified as Schedule I illegal drugs. This led to a halt in virtually all research related to those compounds.

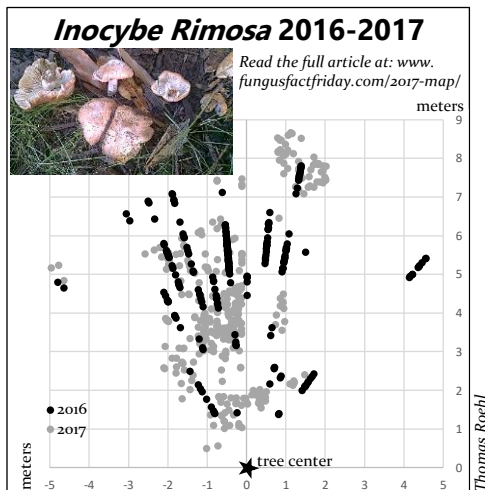
The first study on psilocybin in the United States since the 1960's occurred in 2006 at Johns Hopkins University under rigorous ethical standards. This study laid the groundwork for other researchers in the late 2000's and 2010's, which largely used the same process.

The recent studies revealed that psilocybin induces significant spiritual experiences and causes positive behavior change. In a study that made headlines in 2015 and 2016, researchers found that psilocybin helped reduce anxiety and depression in cancer patients. Researchers at Johns Hopkins and other universities hope to build on this work, but are still hampered by the drug's Schedule I status. 🍄



William Needham described the history of psilocybin use, from ancient times through to today.

Mushrooms



is very little overlap between *I. rimosa* and that *Russula*.

Since *I. rimosa* and the red *Russula* with a tan margin have such a well-defined border, they probably interact with the tree in an identical manner. Most likely, these two species provide the tree with the same ratios of nutrients in exchange for the same proportion of sugars. Because of this similarity, neither would be competitive in the other's territory. This model assumes the border between the two mushrooms will be stable over time. I don't have data on the *Russula* from 2016, so I will have to wait until summer to test this idea.

The most interesting parts of the map are the areas where certain species are not excluded. Consider *Boletus harrisonii*: it appeared in a V-shaped pattern with one end of the V cutting into the heart of *Inocybe rimosa* territory and the other end crossing over the area dominated by the red *Russula* with a tan margin.

Why is *B. harrisonii* allowed access to these territories? *B. harrisonii* overlaps significantly with the other two mushrooms, which could indicate that it isn't directly competing with those fungi. Perhaps *B. harrisonii* provides the tree with certain nutrients that *I. rimosa* and the red *Russula* with a tan margin cannot and vice versa. Of course, you can't be sure of what *B. harrisonii* is doing based on my map. For that, you'd need to analyze the nutrient exchange rates between the bolete and the tree.

Diversity

In 2017, I counted 14 different mycorrhizal species fruiting below my willow oak. Ten of those were russulas, two were boletes, one was an *Inocybe*, and the other was a *Scleroderma*. It amazes me that so many species of *Russula* can survive in such a small area. This is particularly impressive when you realize that every other genus appearing in my yard is represented by a single species. Why are russulas able to coexist with one another better than mushrooms from other genera? Your guess is as good as mine.

By counting the number of species present as you move away from the tree, you find that there are four distances where diversity peaks: 1.19m (5 species), 2.16m (6 species), 3.60m (7 species), 4.84m (6 species). The first two peaks are a result of the overlap between mushroom species that fruit close to the tree and those that fruit farther away.

The third peak is the most significant; half of the mushrooms I found had ranges that crossed this point and all but three species produced at least one mushroom before this point. Interestingly, 3.60m is almost exactly half the distance between the center of the tree and its farthest branches, which I measured to be 7.04m. This data suggests that for most mushrooms in a forest, their host tree is probably the closest tree that forms branches above the mushrooms. That will be useful next time you need to decide which tree in a forest a mushroom is growing under. Keep in mind that I'm using a very limited data set, so it's possible that my conclusions don't apply to mushrooms generally.

The third and fourth peaks in diversity correspond to two diversity hotspots on the map. One of these hotspots lies just to the west of the tree at 3.60m and the other lies a bit to the east of the map's north-south axis at 4.84m. Both are easily visible because they have a tight cluster of mushrooms from at least three different species. Neither hotspot looks interesting aboveground; they are both grass-

covered patches of lawn that are just the same as the rest of the lawn. What is causing these hotspots? I have no idea.

Inocybe rimosa

I. rimosa was the most prolific mushroom in my yard last year. That species alone produced 353 mushrooms, pushing up 327 within a two-week period in mid-September. It first appeared on September 9 and produced four flushes of mushrooms through October 26.

Based on their distribution on the map, differences in timing, and slight differences in color, I estimate that there are at least seven and possibly nine or more individuals of *I. rimosa* in my yard. The easiest ones to see on the map are the three disconnected groups in the northeast quadrant and the small group in the far northwest. These are all the same species but clearly arise from separate mycelia. This is surprising because although *I. rimosa* takes up the largest area on the map, each individual mycelium is about the same size as the mycelium of other species. Is there a maximum size for individuals under my tree or is this a feature unique to *I. rimosa*? It would be interesting to map out the mushrooms under an older and larger willow oak to see how maximum individual size changes as trees age and map mushrooms under different tree species to see if host species has an impact on maximum individual size.

How does the 2017 map of *I. rimosa* compare to my 2016 data? It is difficult to read too much into this, since I improved upon my mapping methods throughout 2017. The old method didn't give me very good definition far away from the tree, which is why the mushrooms appear in lines on the map. Still, you can see that in 2017, *I. rimosa* largely disappeared from three areas but significantly expanded its presence in the northwest and central areas of the map. Is this ebb and flow characteristic of mycorrhizal mushrooms? By continuing this project in 2018, I hope to begin to answer that question. 🍄

Fungi in the News

Thomas Roehl
MAW Newsletter Editor

Editor's Note: This article contains summaries of the biggest fungus-related news from December 2017 through February 2018. Visit the link following each topic below for a closer look.

Zombie Ant Fungus Doesn't Infect Brain

Ophiocordyceps spp. are amazing organisms that infect ants and force them to climb up a tree before killing the ants and fruiting from their heads. Because the fungus controls the ants' actions, infected ants are commonly referred to as "zombie ants." Researchers studying the fungus made a remarkable discovery last year: the fungus doesn't actually infect the ants' brains. Instead, the fungus strategically infects every other part of the ant's body, suggesting the fungus directly controls the ant's muscles. So why does the fungus leave the ant's brain intact and how does it control the insect's muscles? Researchers aren't sure and hope to investigate the fungus further. Read more at: <http://www.newsweek.com/parasite-zombie-ants-hijacks-bodies-not-brains-707816>

Biocontrol Reduces Aflatoxin Levels in Tanzania

Aflatoxin, a toxic compound produced by *Aspergillus flavus*, is one of the most economically significant mycotoxins. The fungus itself doesn't harm crops very much, but farmers cannot sell contaminated crops and aflatoxin causes short-term and long-term disease in humans. Over the last two years, researchers in Tanzania conducted a field trial of AflasafeTZ, a biocontrol agent that uses non-toxic fungi from Tanzania to outcompete *A. flavus*. When the harmless fungi in AflasafeTZ were applied to maize, they reduced aflatoxin content by 85 percent. If Tanzania can make this

technology widely available, it could help reduce aflatoxin-related deaths and illness as well as help farmers sell more of their crops. The United States Department of Agriculture helped develop Aflasafe and is working to help apply the biocontrol agent in various countries across Africa. Read more at: <https://www.scidev.net/sub-saharan-africa/farming/news/biocontrol-tech-slashes-aflatoxin-levels-in-tanzania.html>

WNS Can't Repair UV Damage

This is the best news for bats in a long time. Scientists researching the fungus that causes the devastating bat disease White Nose Syndrome (WNS), discovered that the fungus cannot repair damage to its DNA caused by ultraviolet (UV) light. Preventing and repairing damage from UV light is an essential process for any organism that encounters sunlight. Apparently, this cave-dwelling fungus almost never contacts sunlight and therefore doesn't need to repair UV damage. As a result, it evolved to do without the cellular machinery to repair UV damage. Conservationists hope to take advantage of this trait by installing UV lights in sensitive caves. This would be an easy way to help kill the fungus without harming the bats. Of course, the lights cannot be installed everywhere, but strategically placing the lights could help save the most important bat colonies and limit the spread of WNS. Read more at: <https://www.washingtonpost.com/news/animalia/wp/2018/01/04/scientists-say-this-fungus-is-dracula-with-a-twist-it-kills-bats-but-its-afraid-of-light/>

Using Fungi to Create Self-Healing Concrete

Concrete is ubiquitous in the modern world, forming the basis of nearly everything we build. Unfortunately, concrete is very susceptible to water damage. Water causes tiny cracks in concrete, which develop over the course of many years into large cracks that

impact structural integrity. Researchers recently tried a novel idea to seal tiny cracks in concrete as they appear: add fungal spores to the concrete mix. When water gets into the concrete, the fungal spores – in this case *Trichoderma reesei* – will germinate. As they grow, they form calcium carbonate, which fills the cracks. The fungus stops growing when the water dries up but revives again the next time the concrete is exposed to water. The biggest problem with using fungi is that the spores are larger than normal air spaces in concrete, so they may be crushed as the concrete sets. Read more at: <https://www.technologyreview.com/s/608717/how-mushrooms-could-repair-our-crumbling-infrastructure/>

Truffle Found Growing in Rooftop Garden in Paris

Last December, a hotel in Paris made a surprising discovery: a winter black truffle was growing in their rooftop garden. Winter black truffles usually grow in Mediterranean climates, so finding one a short distance from the Eiffel Tower was unexpected. This is good news for efforts to increase biodiversity in cities, since it demonstrates that rooftop gardens can harbor all kinds of unexpected species. Read more at: <http://www.bbc.com/news/world-europe-42465056>

SFD Could be Global Threat

In a study published late last year, researchers warned that most snake species are probably susceptible to Snake Fungal Disease (SFD). The researchers assessed the relationships between snakes in North America and Europe that are known to be infected by the disease. That analysis revealed that susceptible snakes belong to all lineages, suggesting susceptibility is widespread. Consequently, SFD has the potential to spread around the globe much like the frog disease chytridiomycosis did. Read more at: <https://www.nytimes.com/2017/12/20/science/snakes-fungus.html>

Tales of the Fun Guy

