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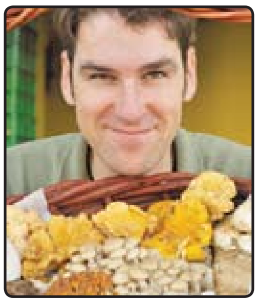
Speaker for February 19 MSSF Meeting



Todd Spanier

Tales from a Lifelong Forager

Todd Spanier has been hunting mushrooms since age six, and is descended from a long line of Italian and Swedish mushroom foragers. Todd believes mushrooms have a unique ability to bring cultures together. His company, *King of Mushrooms*, supplies wild mushrooms to over 200 Bay Area restaurants, including Chez Panisse, Lavanda, and Millenium.

Inside This Issue...

MycoDigest: Fungal Snares and Other Sticky Ends

Else C. Vellinga

For over twenty years we have watched a fallen oak be devoured by oyster mushrooms. At first the decay went slowly, but during the last few years it has accelerated. This winter, for the first time, we could not really find the wood, and the oyster mushrooms had disappeared.

Wood is a very inhospitable substrate. Its components are hard to break down and, though rich in carbon (C), nitrogen (N) (an essential component for amino acids and proteins) is in very low supply. Wood decayers have come up with ingenious ways to cope with this shortage, including one chemical pathway that has bioluminescence as a by-product (e.g. in the jack-o'lantern).

Pleurotus ostreatus **fruitbodies on wood. The mycelium in the wood produces toxic drops that paralyze nematodes, which are consequently devoured by the fungus.** Photo © by John Lennie

Oyster mushrooms and their relatives in the genus *Hohenbuehelia* (gilled mushrooms chockfull of thick-walled incrusted cystidia, with a gelatinous layer in the cap) have come up with a remarkable alternative—they devour nematodes. The mycelium of these species forms drops (in the case of *Pleurotus*) or adhesive knobs (*Hohenbuehelia*), which contain toxins that paralyze the nematodes (which are very small worms). The reaction of a nematode to these toxins is immediate—it stops wriggling and forms a simple target for the hyphae of the fungus. The hyphae hone in on the mouth of the nematode and enter the animal, which is at this point still alive. The hyphae proceed inside and devour the nematode from the inside out. Just like humans

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MycoDigest is a section of *Mycena News* dedicated to the scientific review of mycological information.

MycoDigest continued

eat meat for their protein supply, so does the oyster mushroom "eat" the nematode.

Hohenbuehelia species that do this have been known for a long time, but mostly not in the form of fruiting bodies; rather, they exist as sterile mycelia in the soil under the genus name *Nematoctonus*. Another source of nitrogen for the oyster mushrooms is bacteria, and this might be the case for more species than we realize. There is a report that *Laccaria* species can obtain nitrogen from springtails—another way of getting this essential part of the fungal diet. It is, however, not known how the *Laccaria* are able to kill the springtails.

The nematode-killing abilities of the oyster mushrooms, plus *Hohenbuehelia*, are not found in other gilled mushrooms. Instead, they form a separate group that, in an evolutionary context, is close to the family of the deer fungus, *Pluteus*. However, fungi in the Phylum Ascomycetes have come up with the same idea to supplement their spartan carbon diet. One order in particular, the *Orbiliales*, is rich in species that have come up with fascinating trapping devices. The genus *Orbilia* is an example; its species form very small, glassy, brightly colored little cups on wood, which are easily overlooked.

The classical and thorough work—with beautiful illustrations—on these nematode-trapping fungi was done by Drechsler in the 1930s. There are at least five different models of these traps, including adhesive knobs, two-dimensional or 3D networks of adhesive cells, adhesive columns, and a lasso-like structure made up of three cells that inflate (like an air bag) when the nematode pokes in. Rings that do not inflate are also found, but only in combination with the adhesive knobs (which makes sense). Educational movies on the workings of those traps can be found online at www.microbelibrary.org. How these structures have evolved, and which ones are more derived, is not yet quite clear—the two papers dealing with this issue reach opposite conclusions. One paper has the 3D networks primitive and the adhesive knobs derived, while the other reverses the order.

Recently, hyphae with non-constricting rings were found in a piece of amber dating from the Late Albian period during the Cretaceous (around 100 million years ago). Nematodes were present in the same amber, which indicates that this type of interaction is not a modern invention at all. To put this in perspective, small mushrooms, very closely resembling modern *Marasmius* species, have been found in 90–94 million-year-old amber from New Jersey. Arbuscular mycorrhizal fungi have been found in much older deposits, dating from the Ordovician (460 million years ago).

There is a huge interest in using the nematode-trapping fungi as possible bio-control agents for those nematodes that cause animal and plant diseases, and also in the fungal species that might be a threat to those nematodes which are, themselves, used to controlling plant-pathogenic insects.

Oyster mushrooms can be found on almost every walk in the woods, and the soils of the grasslands and forests harbor many species of other nematode trappers. Does this make you think of Gulliver? You might not want to stand in one spot for too long!

Further reading:

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Deadline for the March 2008 issue of *Mycena News* is February 15.
Please send your articles, calendar items, photos and other information to:
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