Analyses of the Fungi of the Caribbean Island of Dominica

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Abstract

The aim of this study is to present a resource on the mycology of the island of Dominica and build on the previous projects of students Kyle Toomey and Selyna Nunez. The specimens collected were done so on our group hikes through the following areas: Archbold Tropical Research and Education Centre (ATREC) and surrounding areas; Elfin, (Boeri Lake and Freshwater Lake), Middleham Falls, Cabrits National Park, Emerald Pool, Boiling Lake, and Syndicate Trail as well as Springfield Field Station. This resource, in combination with the others, presents a solid foundation for anyone interested in learning about the mycological diversity found on Dominica; we have but shed a light on the vast number of species of fungi, each fulfilling their niche in the great ecology of the island.

Introduction

Fungi play a fundamental role in nature. They are a major decomposer for both plant and animal life. Without them, a dense layer of dead tissues would accumulate and keep rising, as it did during the Carboniferous period. When woody plants first showed up 400 million years ago, it took fungi 50 million years to evolve a way to decompose it; the resulting coal beds are heavily used nowadays. Fungi reap devastation in agriculture as well. Dominican banana exports have suffered heavy losses as a result of the single species of fungi known as the Black Sigatoka.

Selyna Nunez's 2008 project described seven species: *Cyathus Striatus*, *Lentinus Spp*., *Hygrocybe occidentalis var*. *occidentalis*, *Hygrocybe chloochlora*, *Coprinus plicatilis*, *Pleurotus ostreatus*, and possibly *Auricularia polytricha*. Kyle Toomey's 2009 project included the following families and genera: Bolbitiaceae *Conocybe* , Clavariaceae Ramaria/*Clavariadelphus*, Cortinariaceae *Gymnopilus*, Gloeophyllaceae *Gleophyllum sepiarium*, Hygrophoraceae *Hygrocybe*, Lepiotaceae *Lepiota*, Lycoperdaceae *Calvatia*, Polyporaceae *Pycynoporus*, and Tricholomataceae *Clitocybula abundans*. Kyle was able to identify two fungi down to the species and nine to the genus.

This study contains the following families of Basidiomycetes: Pleurotaceae, Psanthrellaceae, Hygrophoraceae, Marasmiaceae, and Agaricaceae under the Agaricales order, Polyporaceae under the Polyporales order, Diplocystaceae under the Boletales order, Pucciniaceae under the Pucciniales order, and Mycosphaerellaceae under the Dothideomycetes class of Ascomycetes.

Basidiomycetes differ from Ascomycetes in that Ascomycetes came first evolutionary. Ascomycetes produce spores internally in a structure known as an ascus, Basidomycetes produce spores externally on the ends of specialized cells called basidia.

The Agricales order is known for its stereotypical appearance of a mushroom. Typically, they have lamellae(gills), pileus(cap), and a fleshy stipe(stem/stalk). Agaricales have 33 families, 413 genera, and over 13,000 species.

The Polyporales order contains most of the common shelf fungi worldwide. They are pathogens of the forest and are known to cause rot problems

for the timber industry. Some people use polyporales as a food item, others, in things like traditional Chinese medicine.

The Boletales order contains fungi with a diverse assortment of fruiting body types. Most notably, boletes have a spongy surface underneath their cap, rather than the usual gills. The rest of the fungi usually looks just like a regular mushroom.

The Pucciniales order (previously known as Uredinales) are known for their rust fungi. Rusts plague crops worldwide and are responsible for huge losses for farmers. They usually have multiple spore stages and sometimes even multiple overwintering hosts.

The order Capnodiales has recently been expanded to include saprobes, endophytes, and lichens. The genus Mycosphaerella has also recently been added and includes very important tree and crop pathogens.

Materials and Methods

All fungi were collected during our group hikes through the following trails: Archbold Tropical Research and Education Centre (ATREC) and surrounding areas; Elfin, (Boeri Lake and Freshwater Lake), Middleham Falls, Cabrits National Park, Emerald Pool, Boiling Lake, and Syndicate Trail as well as Springfield Field Station. Fungi were discovered for the most part along the predefined trail and not much deeper into the forest. With 16 pairs of eyes aiding the search it was relatively easy to spot most of the fungi present. Once located either I or Dr. Woolley would take pictures of them making sure to get both dorsal and ventral views. I would then collect a few specimens, usually by hand,

and place them in a paper bag, aiming to allow breathability and delay desiccation.

Slide making

Once in the lab, a picture was taken to avoid confusion in matching up spore with fungi. I would label a clean slide with the date discovered, and the number of slide I made that day. A single drop of distilled water was added to the slide by means of a pipette. Before and after every use, the scalpel and forceps were sanitized by dipping them in alcohol. Using the scalpel and forceps, a small sample of tissue was transferred from the fungi along with spores if possible. Under the microscope, I examined the tissue for hyphae and spores, taking pictures with my camera phone (Samsung Galaxy SIII) to make my project a better resource. Once the process was over, I disposed of the slides in a glass disposal bag and the fungi in their own receptacle. Identification was done individually, with the use of the internet. Each of the major orders were searched thoroughly by families and then each family was extensively searched through by genera. Where species could not be identified with a high degree of certainty, the genus was used.

Results

Kingdom: Fungi

Phylum: Basidiomycota

Class: Agaricomycetes

Order: Agaricales

Family: Agaricaceae

Genus: *Agaricus*

Family: Hygrophoraceae

Genus: *Dictyonema*

Family: Psanthrellaceae

Genus: *Coprinellus*

Species: *angulatus*

Genus: *Lacrymaria*

Family: Pleurotaceae

Genus: *Nematoctonus*

Family: Marasmiaceae

Genus: *Trogia*

Order: Polyporales

Family: Polyporaceae

Genus: *Flabellophora*

Genus: *Fomes*

Species: *fomentarious*

Genus: *Hapalopilus*

Genus: *Trametes*

Species: *gibbosa*

Genus: *Tyromyces*

Order: Boletales

Family: Sclerodermatineae

Genus: *Scleroderma*

Class: Pucciniomycetes

Order: Pucciniales

Family: Pucciniaceae

Genus: *Puccinia*

Phylum: Ascomycota

Class: Dothideomycetes

Order: Mycosphaerellaceae

Family: Mycosphaerellaceae

Genus: *Mycosphaerella*

Species: *fijiensis*

Family: Agaricaceae

Genus: *Agaricus*

Description of Genus: The mushrooms in *Agaricus* are characterized by caps that are not brightly colored. At maturity the gills are free or almost free from the stem, and usually have a brownish hue. The stem breaks away cleanly from the cap. *Agaricus* species have a partial veil which often forms a ring on the stem.

Ventral View

Lateral View

Family: Hygrophoraceae

Genus: *Dictyonema*

Description of Genus: *Dictoyonema* contains many tropical lichens. Being a basidiolichen, they are very rare and make up less than one percent of all lichens.

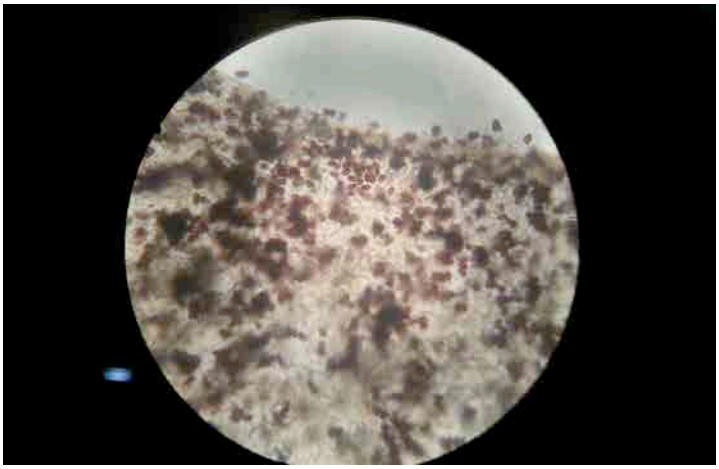
Dorsal View

Hyphae

Family: Psanthrellaceae

Genus: *Coprinellus* Species: *angulatus*

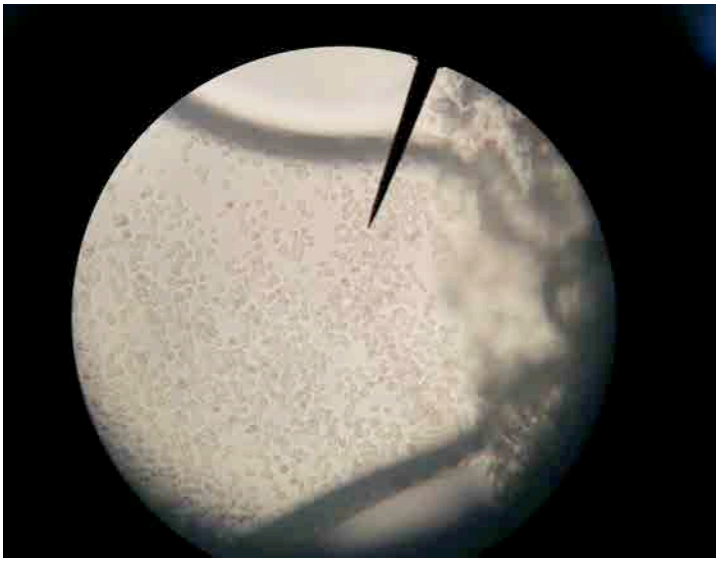
Description of Genus/species: Members of this genus often grow on rotting hardwood tree parts. They have a cone shaped cap and thin waxy stem.



Top: spores

Left: Lateral/ dorsal view

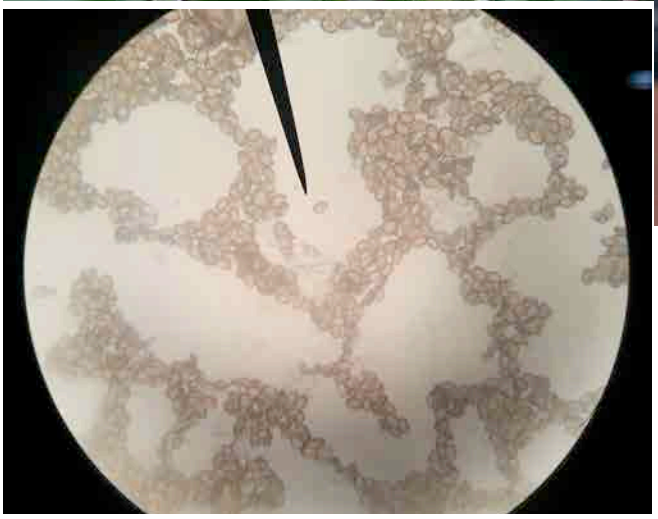
Genus: *Coprinellus*



Left: Lateral/ dorsal view Top: spores

Family: Psanthrellaceae

Genus: *Coprinellus*



Top Left: Lateral/ dorsal view

Bottom Left: Spores

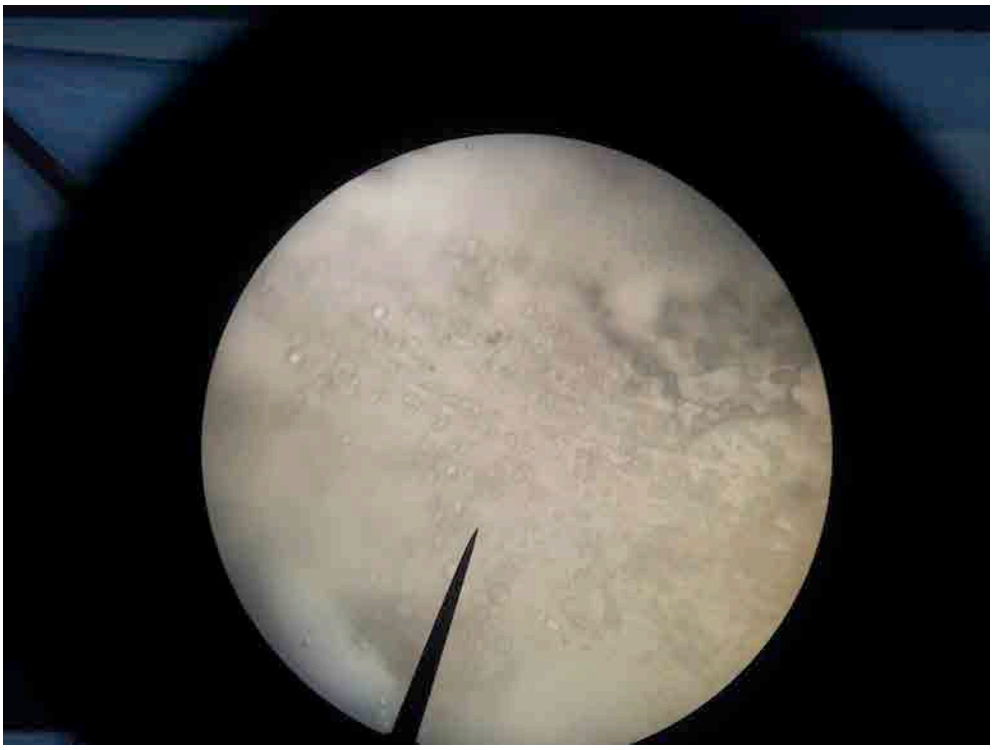
Top Right: Ventral view

Family: Psanthrellaceae

Genus: *Coprinellus*

Top: Lateral/ dorsal view of multiple mushrooms growing on a coconut

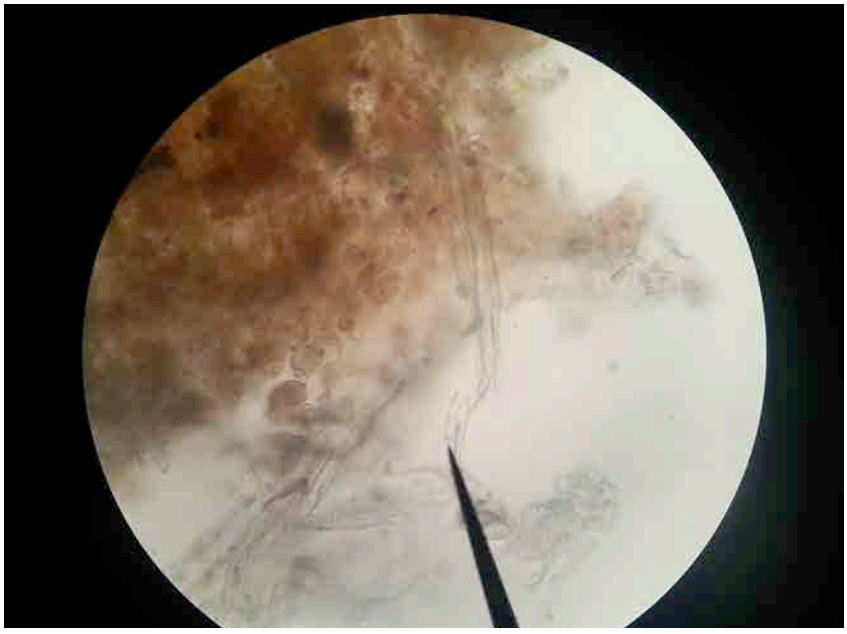
Bottom: Spores



Family: Psanthrellaceae

Genus: *Lacrymaria*

Description of Genus: *Lacrymaria*, along with its family Psanthrellaceae are characterized by a black spore print and autodigestion of their spores upon maturity, after which it releases a black ink-like ooze.



Top Right: Lateral/ dorsal view

Top Left: ventral view

Bottom Left: Spores

Family: Pleurotaceae

Genus: *Nematoctonus*

Description of Genus: Literally meaning “Nematode Murderer” this genus of fungi is parasitic and uses nematodes for nutrients. They possess specialized hyphae that have loops similar to a lasso that constrict and seize nematodes unfortunate enough to try and go through.

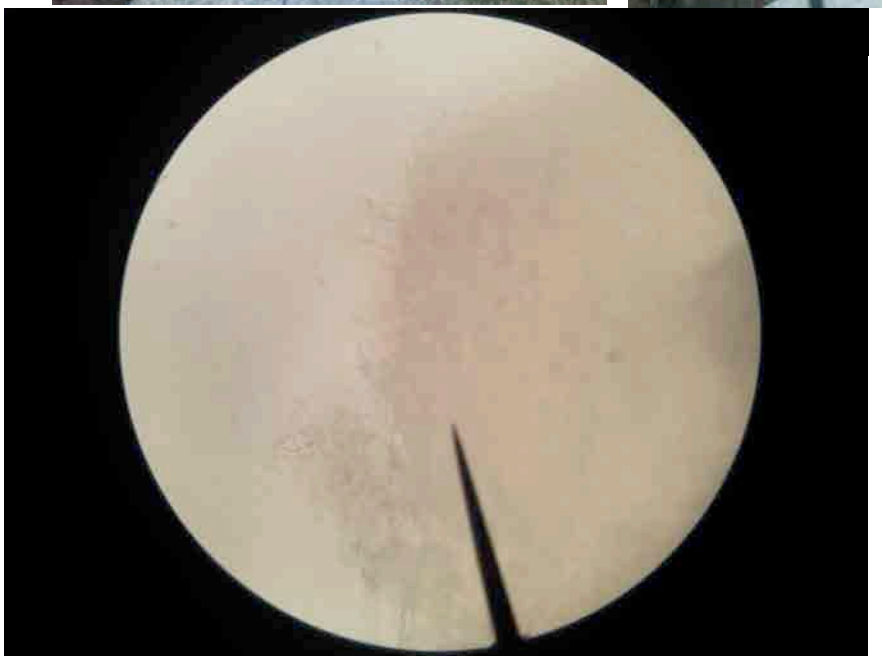
Top Left: Hyphae

Top Right: Dorsal View of sample taken from surface litter

Family: Marasmiaceae

Genus: *Trogia*

Description of Genus: *Trogia* are characterized by fruiting bodies that are tough when dry but capable of reviving when moistened. They grow mostly on woody material and lack partial veils. They have a decurrent gill attachment, a tough cartilage-like stem and broad cap.



Top Left: dorsal view

Top Right: ventral view

Bottom Left: Hypha

Family: Polyporaceae

Genus: *Flabellophora*

Description of Genus: Most *Flabellophora* produce white spore prints. Their flesh is often soft and most have pores on the underside. Some have a stipe.

Top Left: Mycelium

Top Right: ventral view

Bottom Left:

Dorsal/lateral view

Family: Polyporaceae

Genus: *Flabellophora*

Top: Lateral/ Dorsal view

Bottom Left: Ventral View

Bottom Right: Spores/hyphea

Family: Polyporaceae

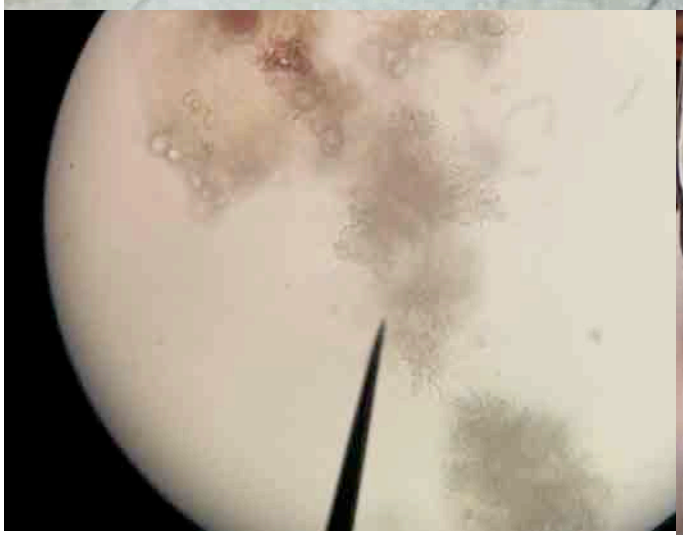
Genus: *Fomes* Species: *fomentarious*

Description of Genus/species: *Fomes* is a genus of woody fungi that are typically ungulate(hoof-shaped). Every season, a new growth is added, resulting in a downwards expansion of the fungi. Concentric bands of color, much like a tree appear. *Fomes* causes rot and varies in color from black grey to brown. They are facultative saprotrophs, able to parasitize their host and decompose it.

Top Left: Lateral View

Bottom Left: Hyphae

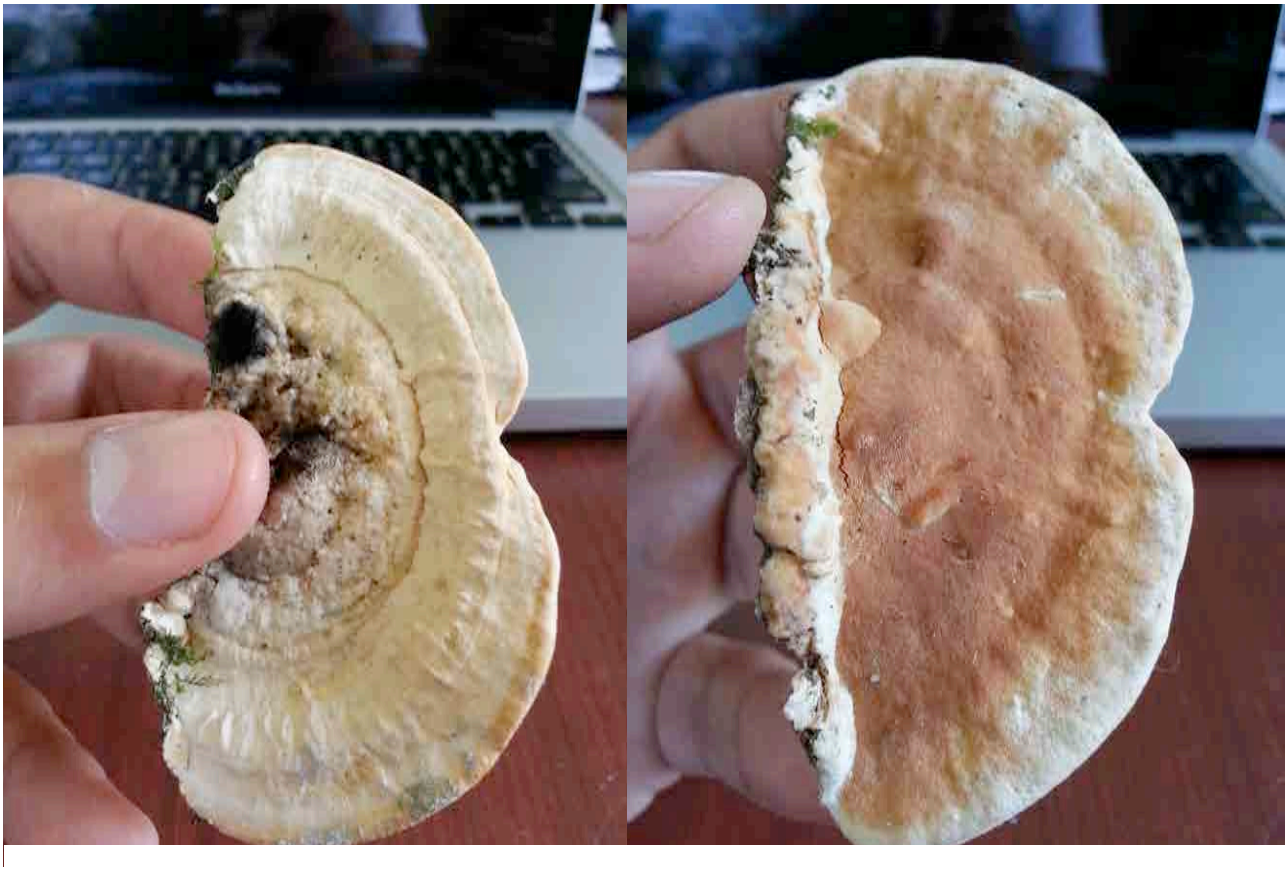
Bottom Right: Ventral View



Family: Polyporaceae

Genus: *Hapalopilus*

Description of Genus: Fungi belonging to the genus *Hapalopilus* are almost always a shade of orange. They sometimes have a stipe. This genus is widely distributed and contains five species.



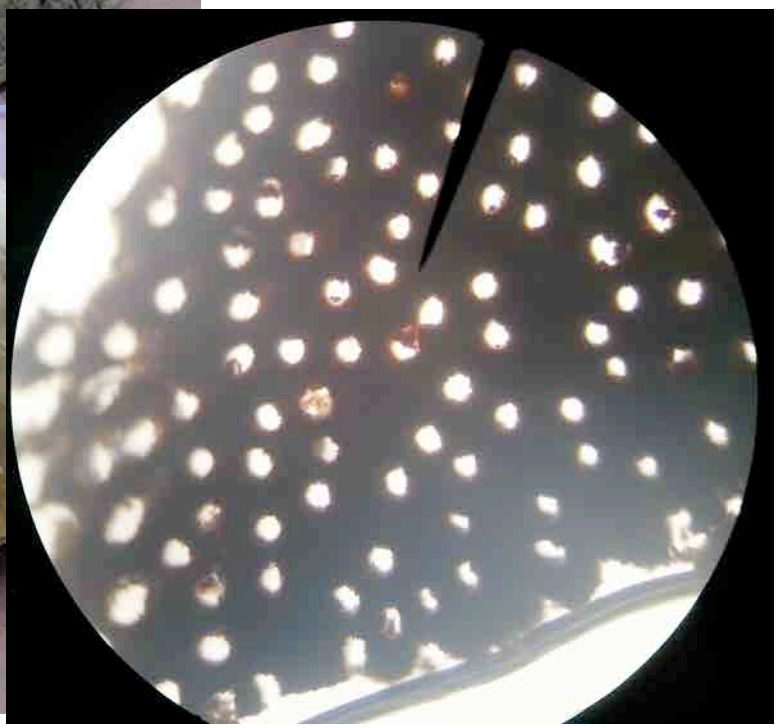
Left: Ventral View

Right: Dorsal View

Family: Polyporaceae

Genus: *Trametes* Species: *gibbosa*

Description of Genus/species: *Trametes* are distinguishable by their smooth spores and pileate. They are a food for some caterpillars and fungus moths. *Trametes gibbosa* causes white rot and is found on dead woody plants. Fruiting bodies can range from 8-15 cm and are frequently attacked by boring beetle larvae. The tops of the fruits are usually white but can turn green from algal growth.



Top Left: Dorsal View

Bottom Left: Ventral View

Bottom Right: Spores

Family: Polyporaceae

Genus: *Trametes*

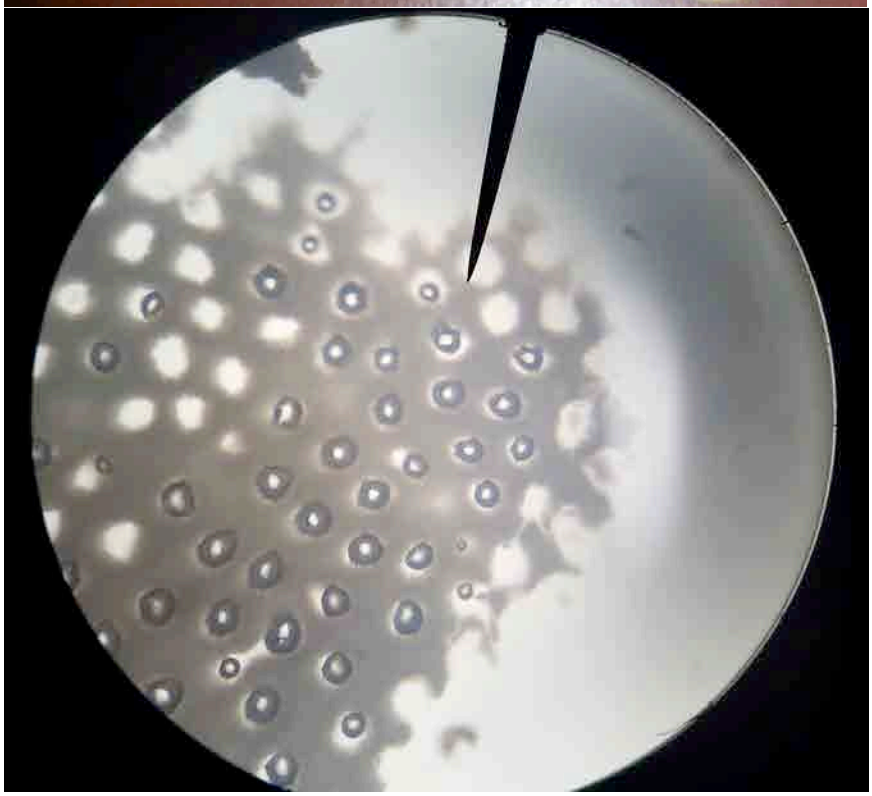
Top Left: Dorsal View

Bottom Left: Ventral View

Family: Polyporaceae

Genus: *Trametes*

Top Left: Dorsal/ Ventral View



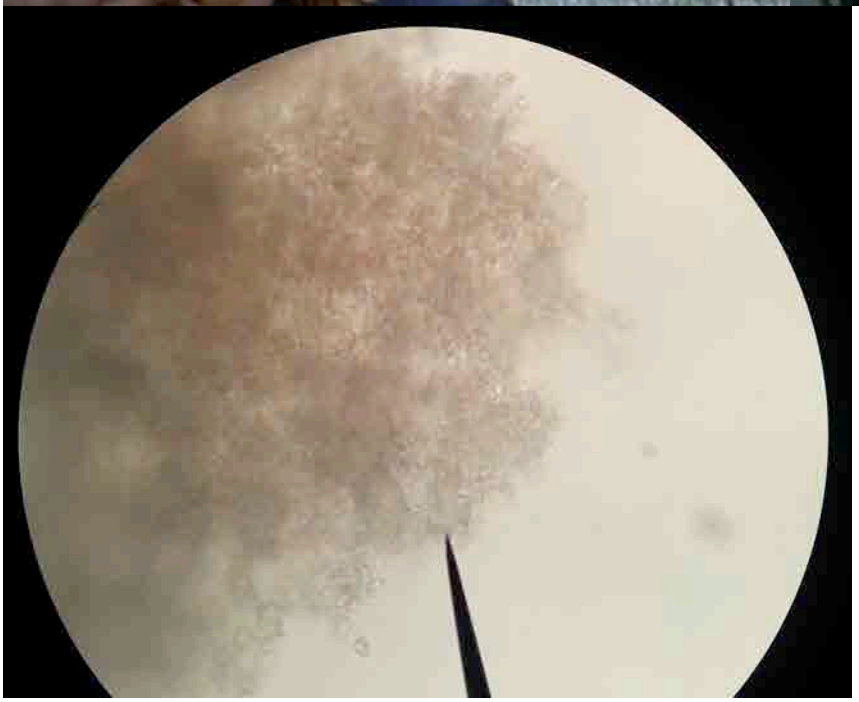
Bottom Left: Spores

Family: Polyporaceae

Genus: *Tyromyces*

Description of Genus: *Tyromyces* are described as having a cheesy consistency.

They are soft and break away easily when disturbed.



Top Left: Dorsal View

Top Right: Ventral View

Bottom Left: Spores

Family: Polyporaceae

Genus: *Tyromyces*

Top Left: Spores

Bottom Left: Dorsal View

Bottom Right: Ventral View

Family: Sclerodermatineae

Genus: *Scleroderma*

Description of Genus: The peridium may be smooth and is always very thick and tough. When it matures, it splits irregularly and reveals dark gleba underneath. Species are ectomycorrhizal and are found near trees. They have a worldwide distribution.

Top: Hyphae

Bottom: Lateral View

Family: Pucciniaceae

Genus: *Puccinia*

Description of Genus: Commonly known as rusts, all species are obligate parasites and plant pathogens. Containing 4000 species, this genus is extremely important for agriculture.

Top Left: Lateral View

Bottom Left: Spores

Family: Mycosphaerellaceae

Genus: *Mycosphaerella* Species: *fijiensis*

Description of Genus/species: Arguably the most important fungi I collected, this Ascomycete deserves a project on its own. Commonly known as the Black Sigatoka this fungi is responsible for huge economic losses in bananas. For places like Dominica it is enough to place a big strain on their economy.

Left: Dorsal View

Top Right: Spores/ Hyphea

Conclusion

I was able to identify four fungi down to the species as well as fourteen fungi down to the genus. Most species I looked at had little to no information on them other than their genus. Without pictures for comparison I would have had to look up individual obscure articles; a task of momentous proportions. The storage and transportation of the specimens could have been better. Paper bags sucked out most of the moisture and degraded the fungi quickly. The contents of my backpack disfigured some samples. As Kyle noted on his project, Tupperware would make a good transport medium as well as overnight storage. To make the best possible identification I would have liked to have been able to culture the fungi in petri dishes in order to have better microscope slides showing the hyphae and individual spores. In hindsight I would have loved to do a project on Black Sigatoka. I saw plenty of the fungi in our excursions and it would have been neat to figure out some sort of density. Over half of my specimens went unidentified due to my lack of knowledge and sample deterioration.

Acknowledgements

First and foremost I would like to express a big thank you to all of my classmates that helped me look for fungus. I only managed to discover a handful while they collectively gave me around thirty samples to look at. I would like to thank Dr. Woolley for his excellent photography skills and Dr. Lacher for setting me straight when I wanted to switch projects.

Works Cited

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