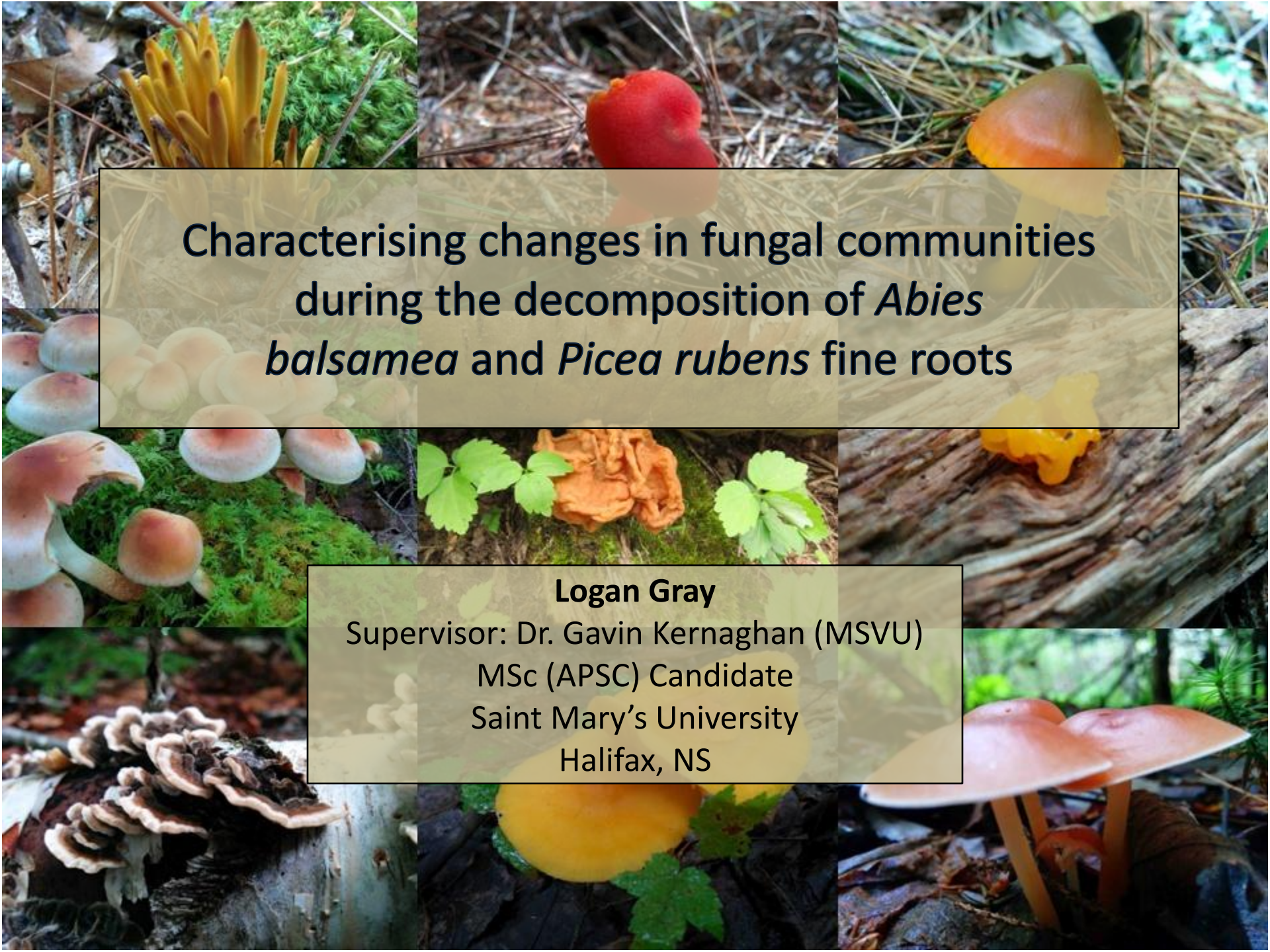
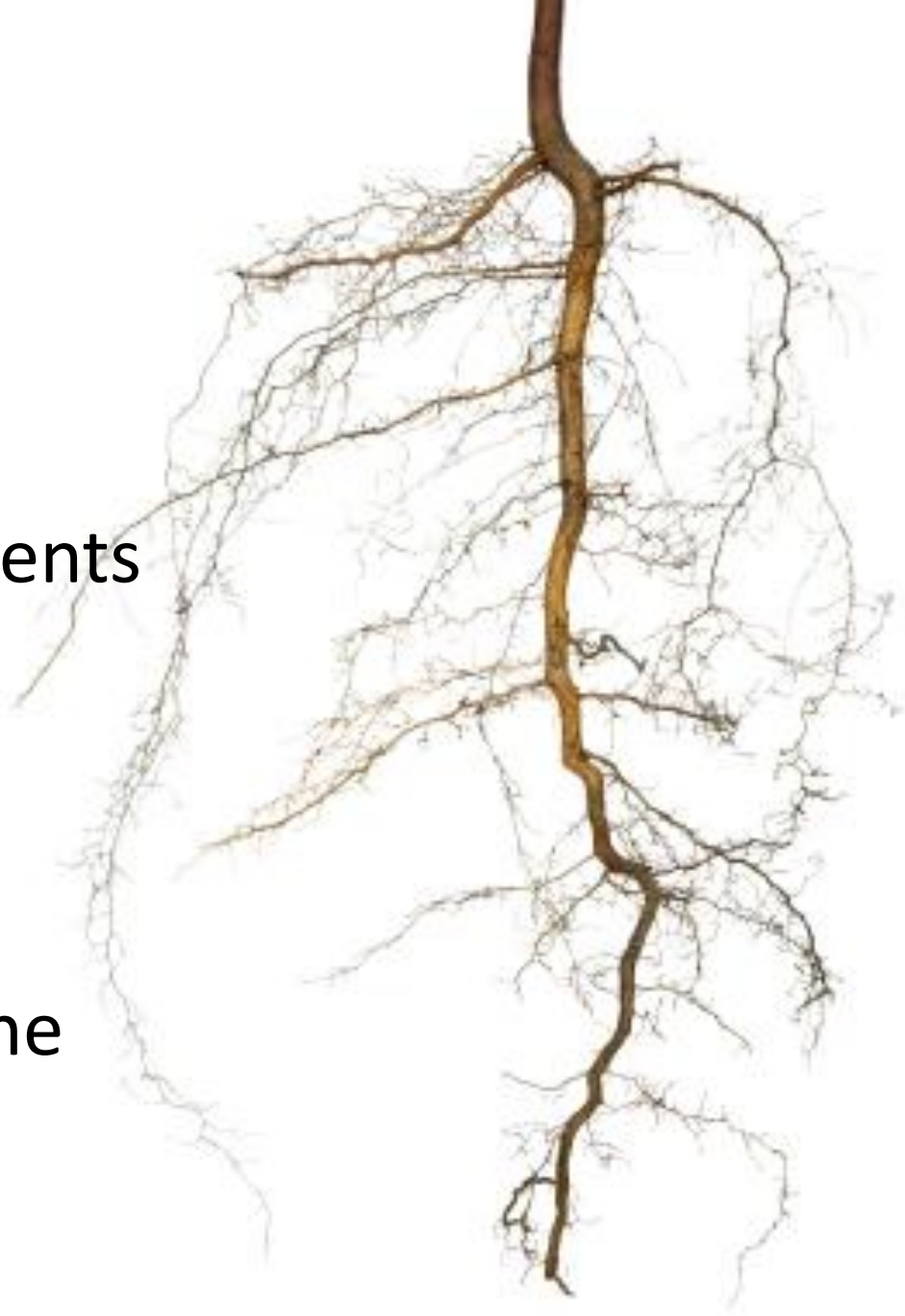


Characterising changes in fungal communities during the decomposition of *Abies balsamea* and *Picea rubens* fine roots

Logan Gray
Supervisor: Dr. Gavin Kernaghan (MSVU)
MSc (APSC) Candidate
Saint Mary's University
Halifax, NS

Why do we care?

- Fine roots
  - < 2 mm diam.
  - absorb water + nutrients
  - ephemeral
  - = huge carbon input
- Root fungi
  - Live in/on/around fine roots
  - 3 different types



Ectomycorrhizal Fungi

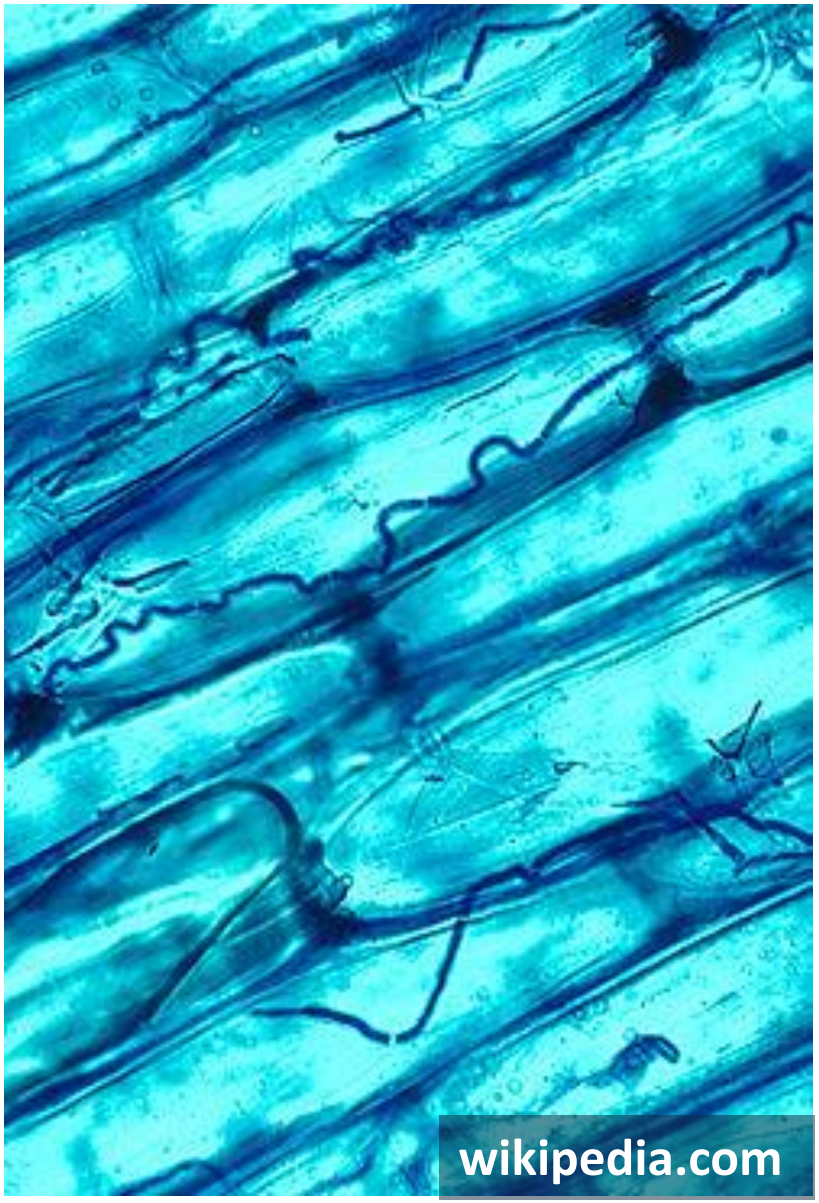
- Mutualists
  - trade nutrients for tree sugars
  - often *necessary* for optimal tree growth
  - sheath root tip with fungal tissue

Cantharellus sp.

Suillus pictus

Endophytes

- **Commensalists ?**
  - live between plant cells
  - not well understood
  - cryptic
- **Latent saprotrophs ?**
  - some have pathogenic genes
- Difficult (for me) to photograph!



Some are culturable

eatlas.org.au

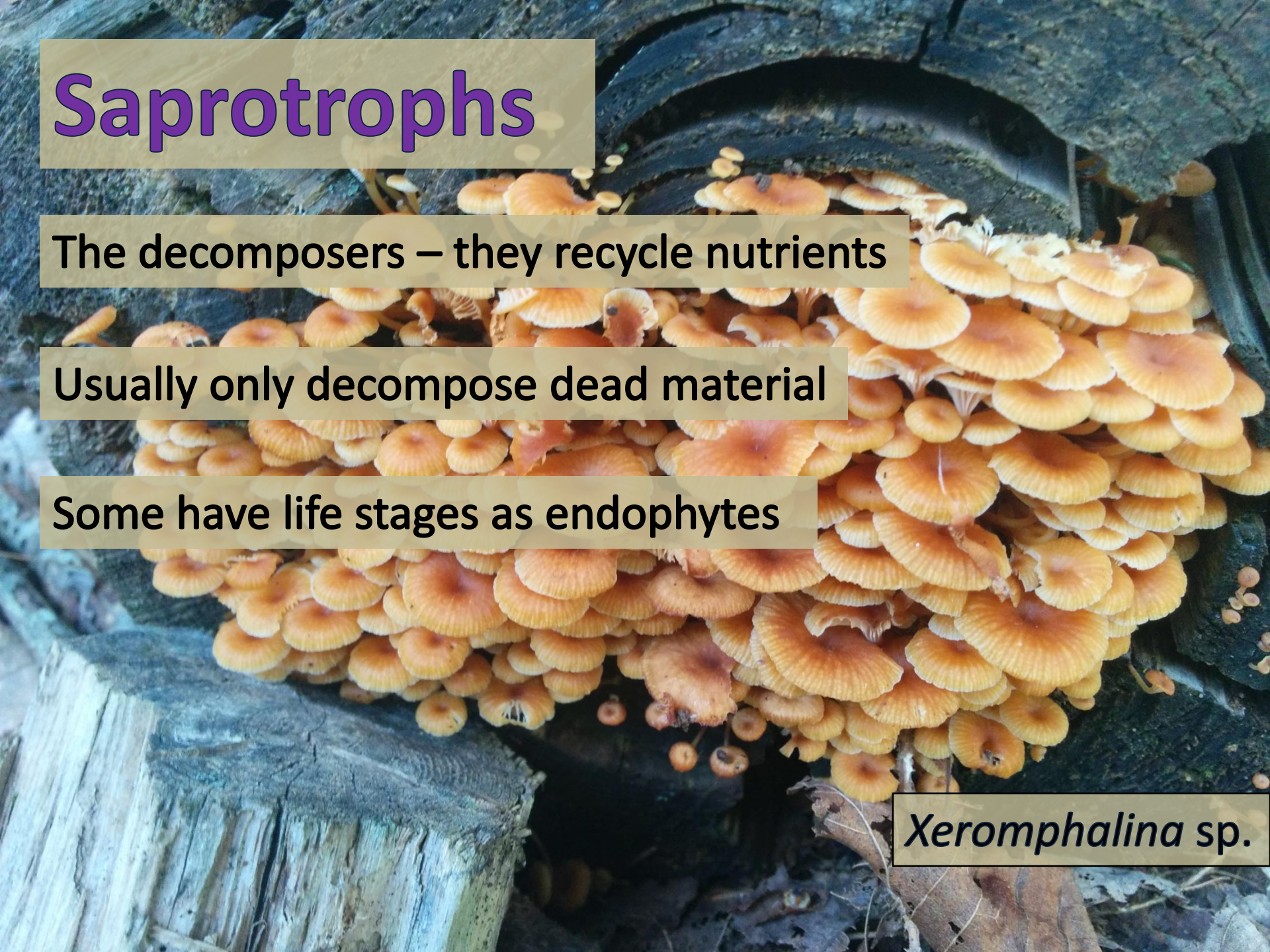

Many are not
http://web.ethlife.ethz.ch/
Phialocephala fortinii

Saprotrophs

The decomposers – they recycle nutrients

Usually only decompose dead material

Some have life stages as endophytes



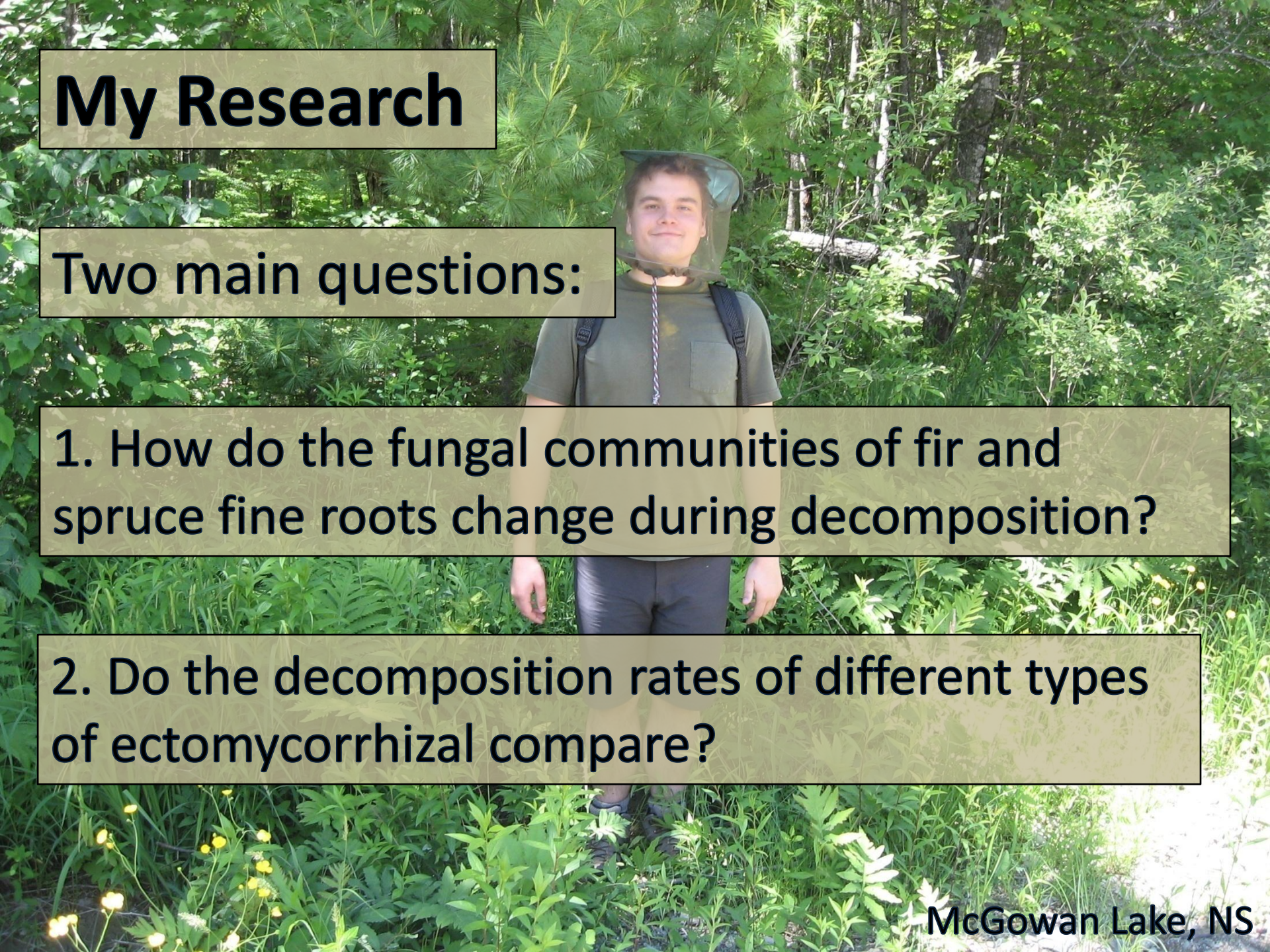
Xeromphalina sp.

My Research

Two main questions:

1. How do the fungal communities of fir and spruce fine roots change during decomposition?

2. Do the decomposition rates of different types of ectomycorrhizal compare?



McGowan Lake, NS


We found canopy gaps with vast regeneration of red spruce and balsam fir...
Old Annapolis Road, NS


...decapitated them...

..and collected root systems monthly over a 16 month period

Then brought them to MSVU

Extracted, amplified, and sequenced fungal DNA

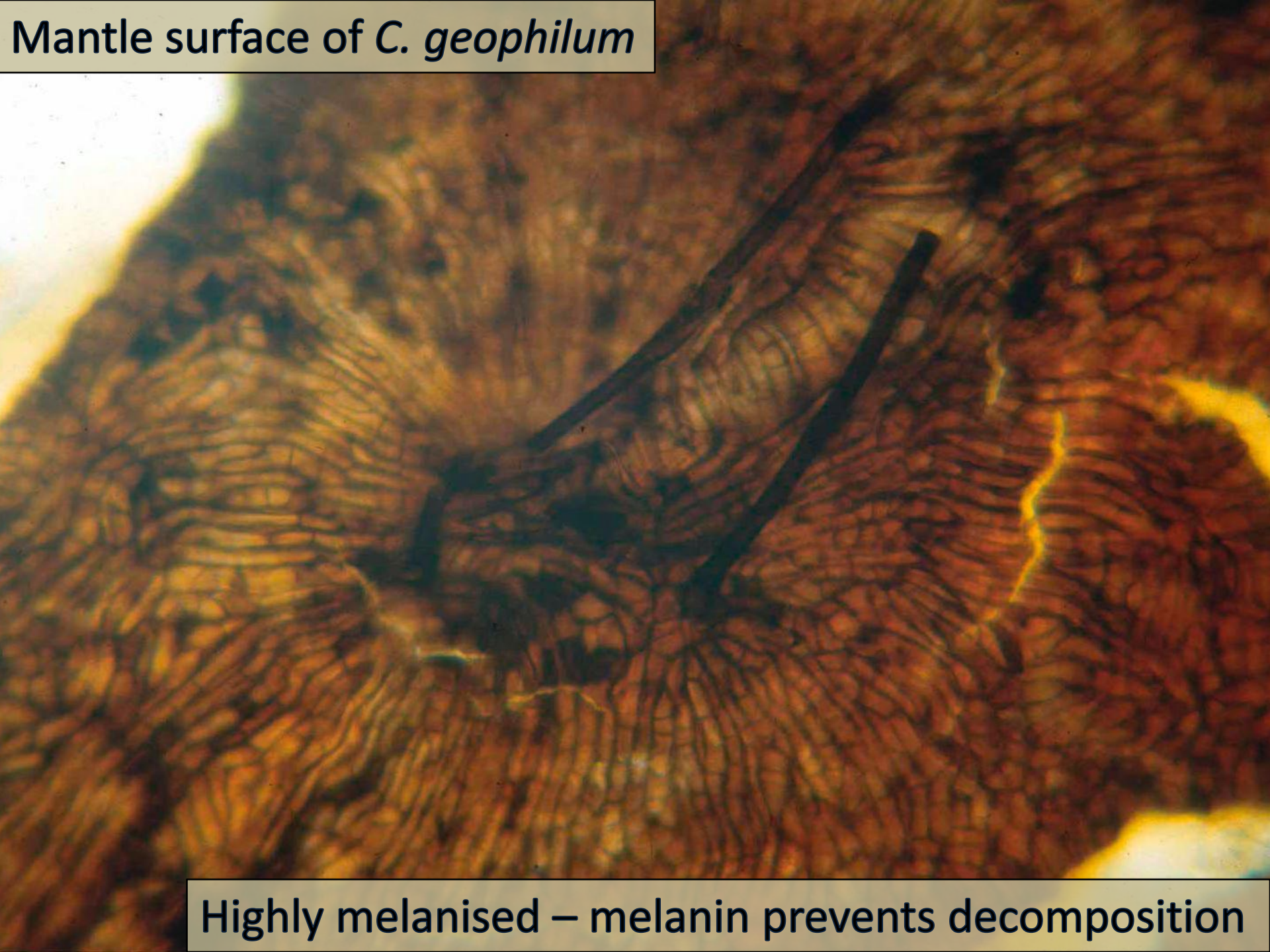
+

Visually identified ectomycorrhizal fungi and rated decomposition

What the data show us

- **Ectomycorrhizal Fungi**
  - **some decompose slower than others**

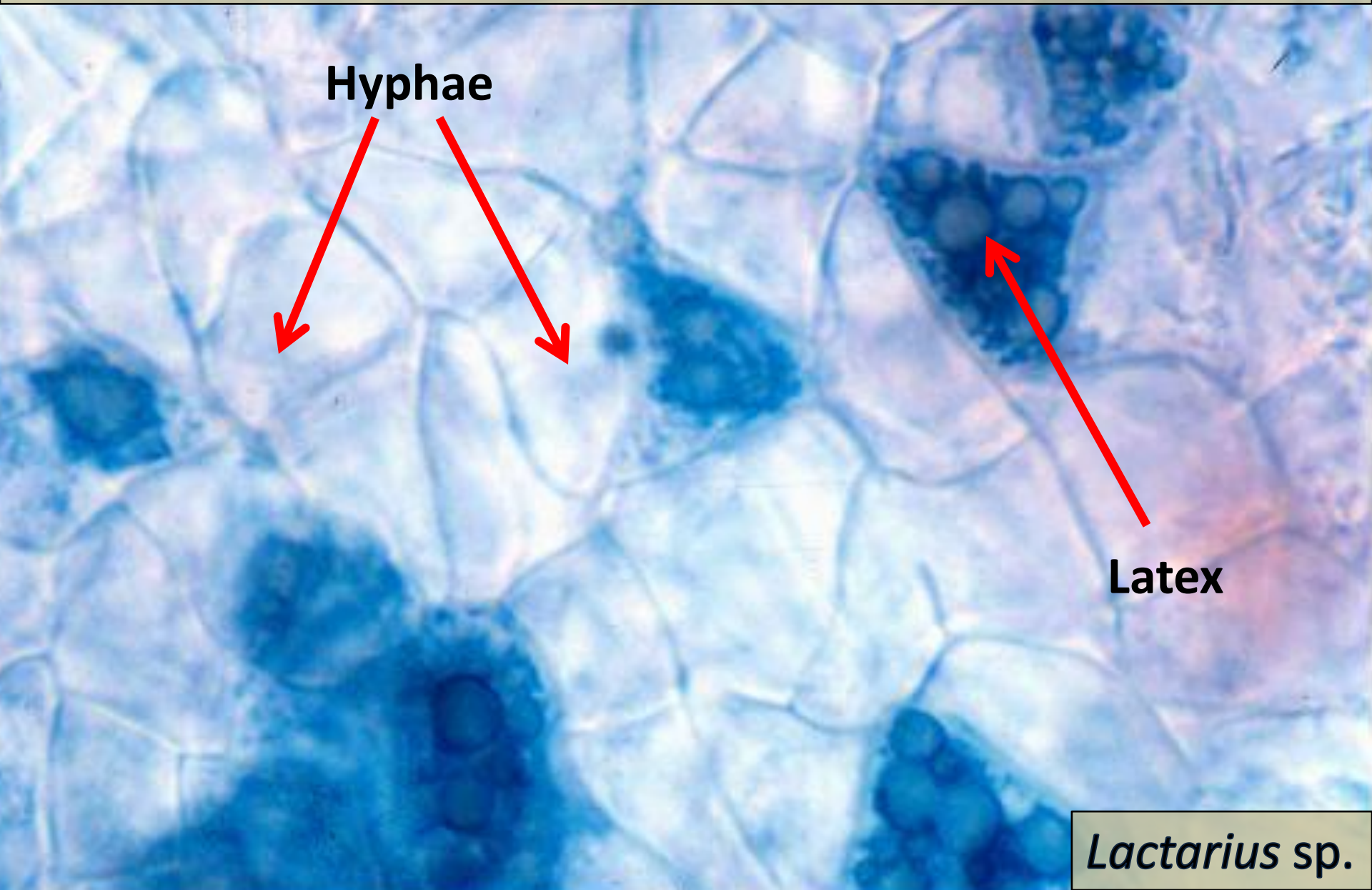

Cenococcum geophilum
Showed almost no signs of decomposition.
Probably sequesters large amounts of carbon


Mantle surface of *C. geophilum*
Highly melanised – melanin prevents decomposition

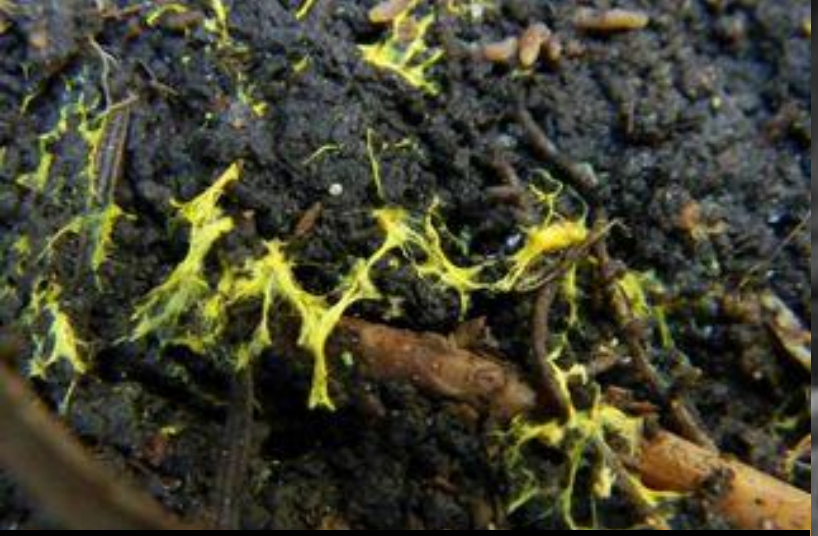
Other fungi showed intermediate decomposition

Russula emitica

Some fungi contain secondary metabolites (*e.g.* sesquiterpenes, latex, etc...) that may delay decomposition



Lactarius sp.



www.mushroomobserver.org

Anti feedant crystals

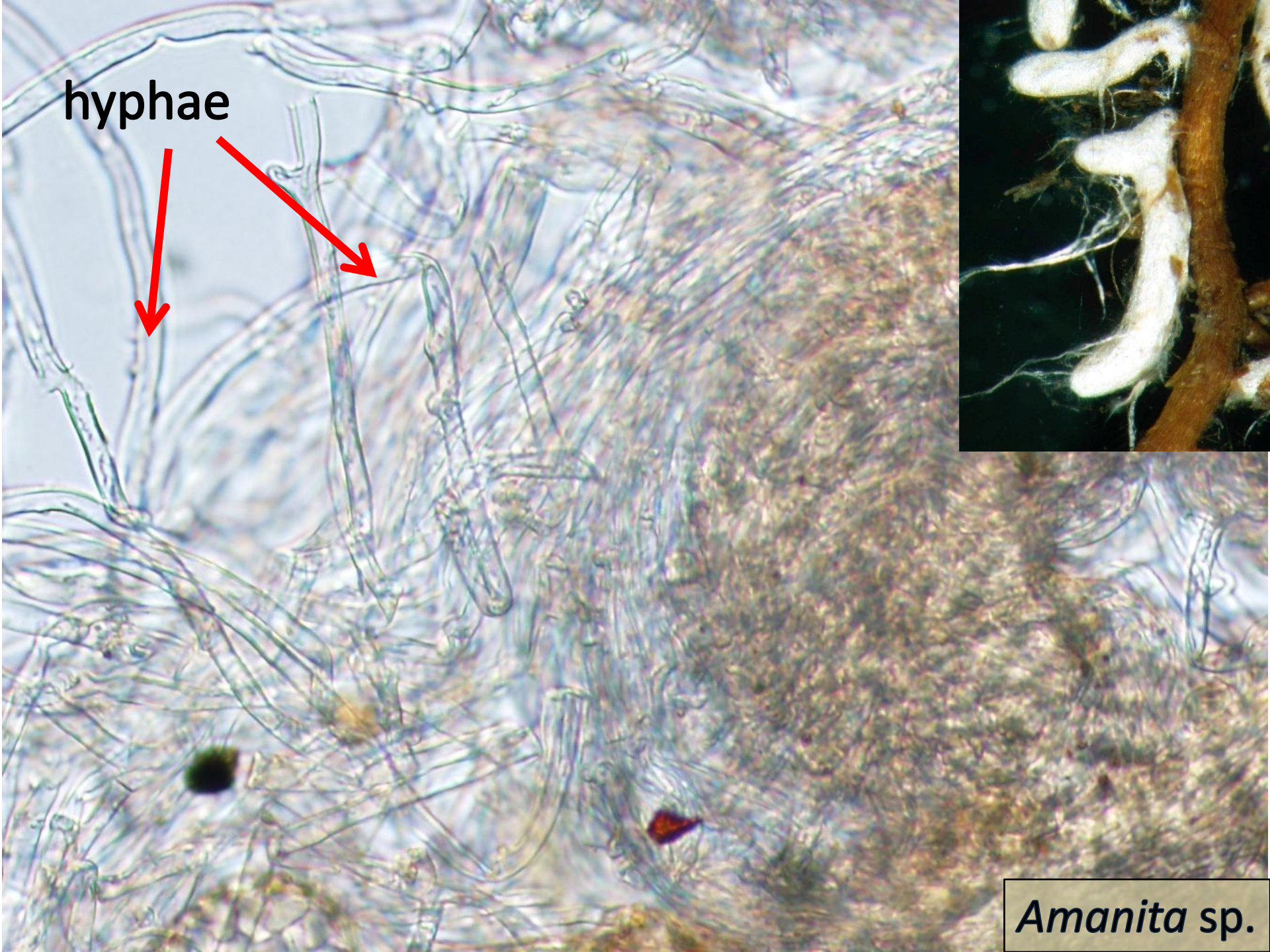
Calcium Oxalate crystals

Piloderma sp.

Some ectomycorrhizal fungi decomposed quickly

Deadly to mammals, but wimpy to microbes / inverts

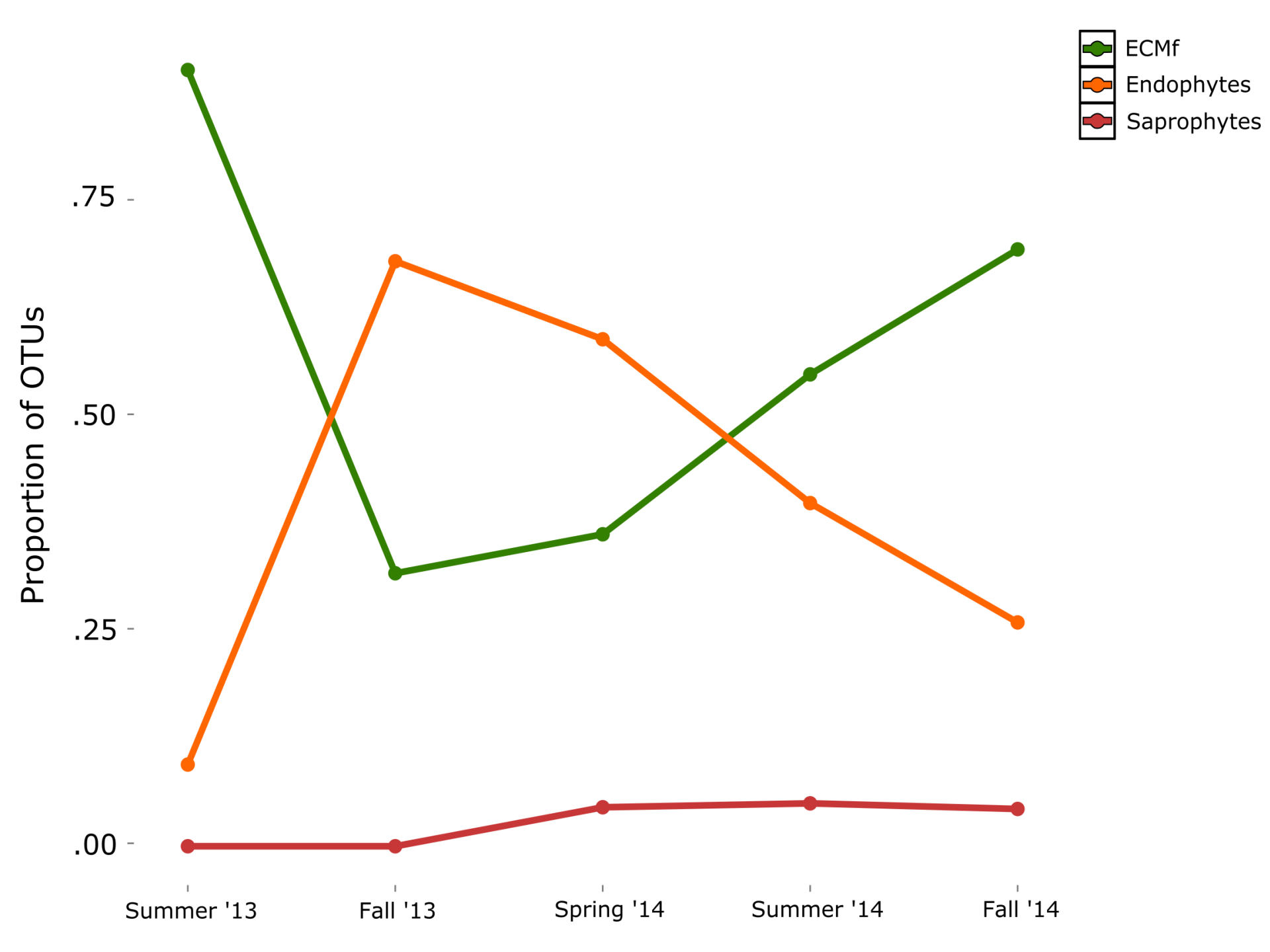
Amanita virosa



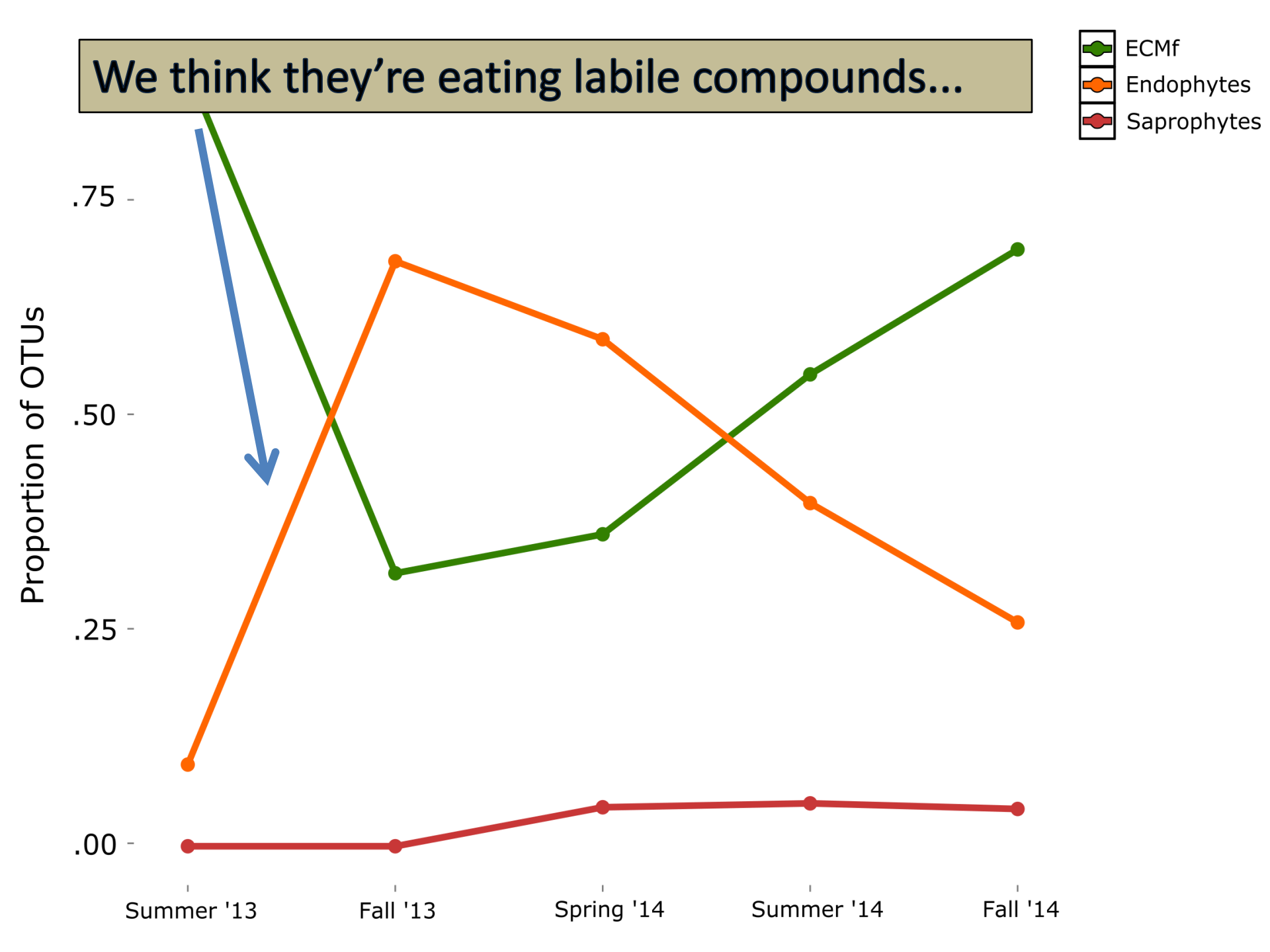
Amanita sp.

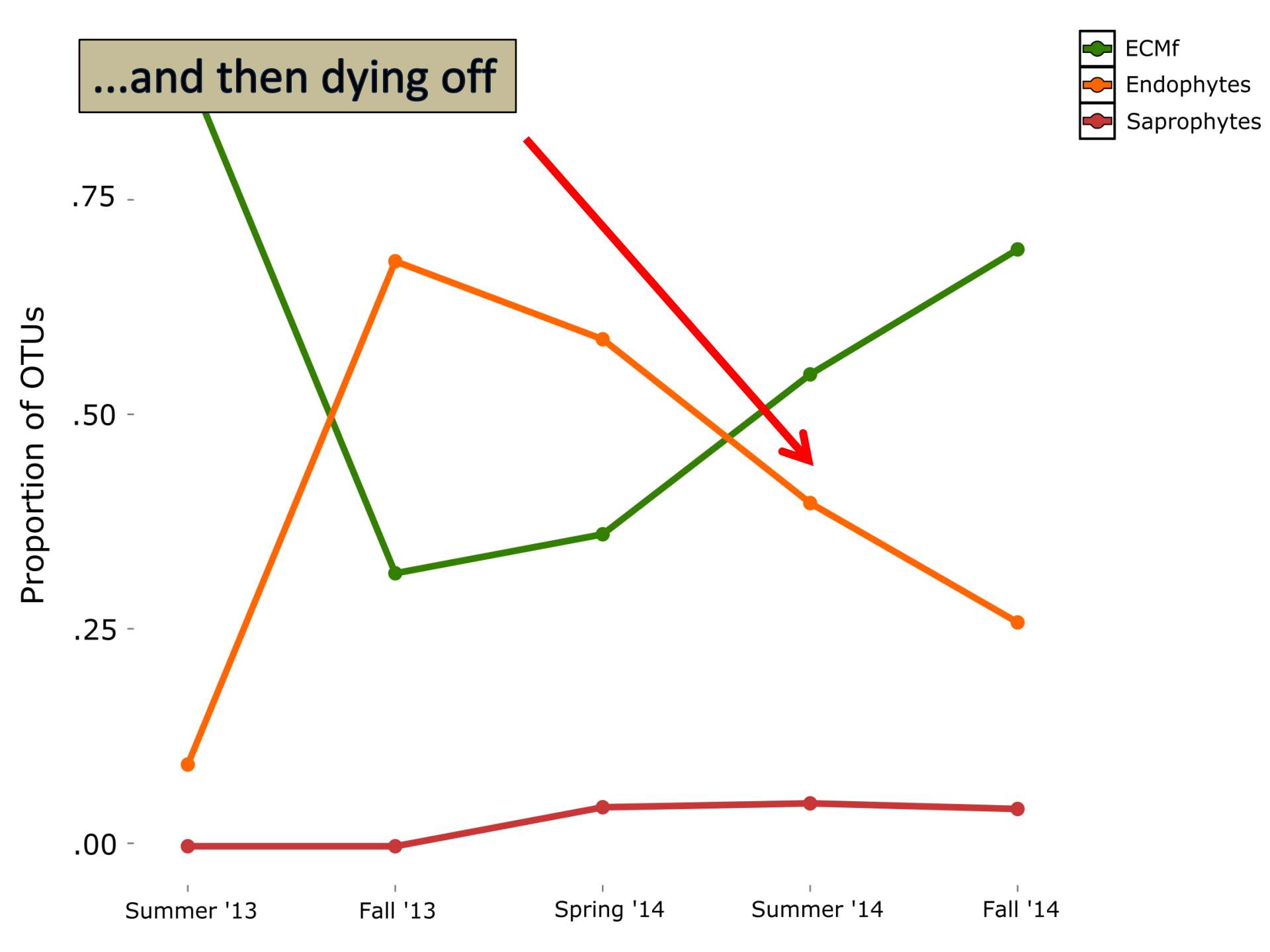
What the data show us

- **Ectomycorrhizal Fungi**
  - some decompose slower than others
- **Endophytes**
  - show initial increase in abundance


ECMf
Endophytes
Saprophytes
Proportion of OTUs
.75
.50
.25
.00
Summer '13
Fall '13
Spring '14
Summer '14
Fall '14

We think they're eating labile compounds...




...and then dying off
ECMf
Endophytes
Saprophytes
Proportion of OTUs
.75
.50
.25
.00
Summer '13
Fall '13
Spring '14
Summer '14
Fall '14

What the data show us

- **Ectomycorrhizal Fungi**
  - some decompose slower than others
- **Endophytes**
  - show initial increase in abundance
- **Saprotrophs**
  - almost non-existent for the first 16 months

We thought these fungi would appear quickly...

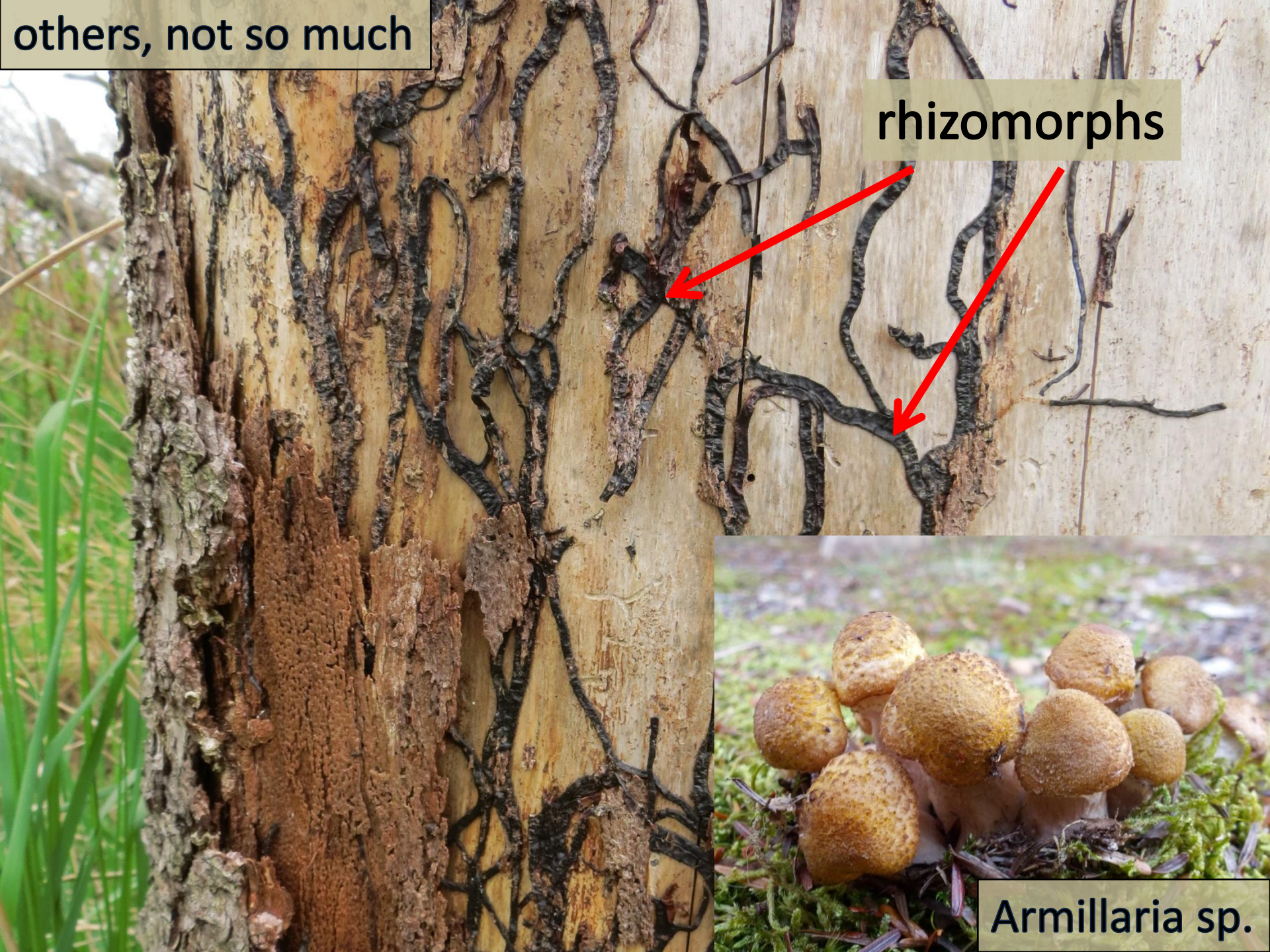
Trametes sp.

...but they were slow to mobilize

Polyporus squamosus

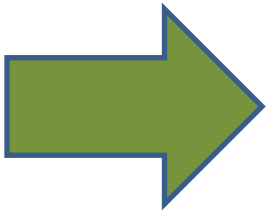
I included them because some are very pretty

Laetiporus sulphureus

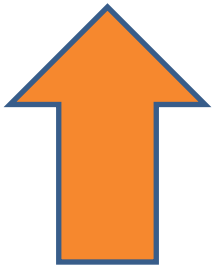

others, not so much
rhizomorphs
Armillaria sp.

Summary of findings

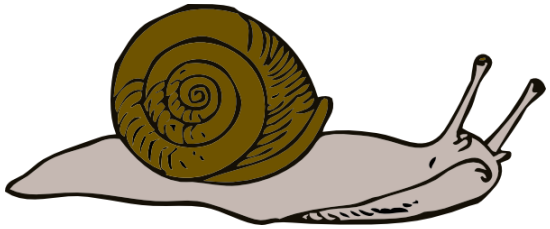
- **Ectomycorrhizal** fungi
  - vary in decomposition rate
  - *C. geophilum* is tough



- **Endophytes** experience "bump"
  - may be eating former host



- **Saprotrophs** are slow
  - didn't show up in large numbers




Thank you for listening