

Symbioses: Lichens

Topics (just the very basics):

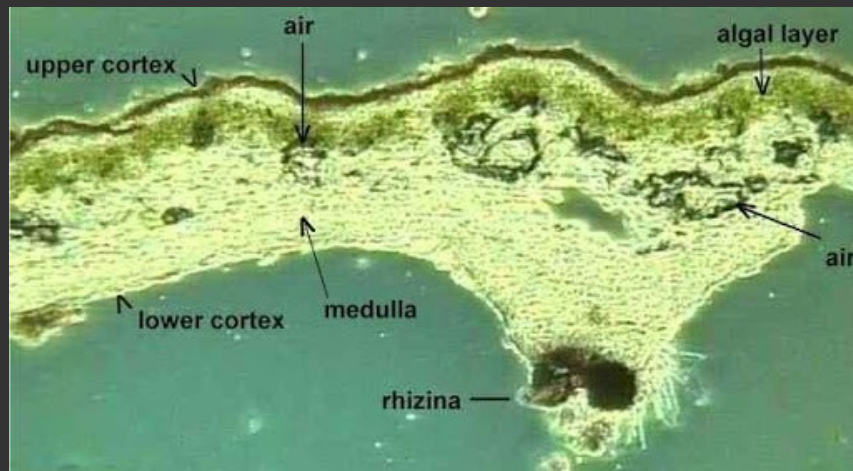
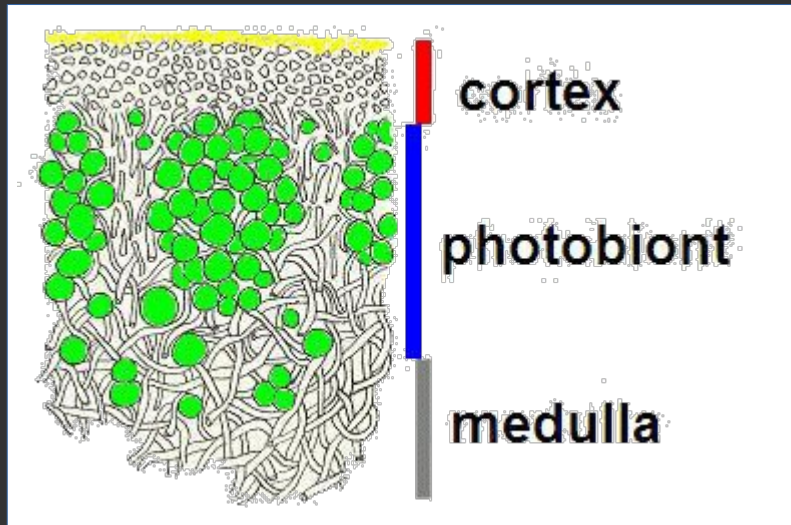
- What is a lichen?
- How to do phylogeny w/ lichens?
- Examples
- Diversity and distributions
- Ecology



More than one species functioning as a
single organism

mycosymbiont + photosymbiont

"Fungi farming algae"



Major growth forms

Crustose Lichens



Foliose Lichens



Fruticose Lichens



Growth form examples

GRAPHIS

crustose - ~~fruticose~~ lirellae -



PARMATREMA

foliose - rhizines? - medulla C
K
Isidia



USNEA

fruticose - central cord

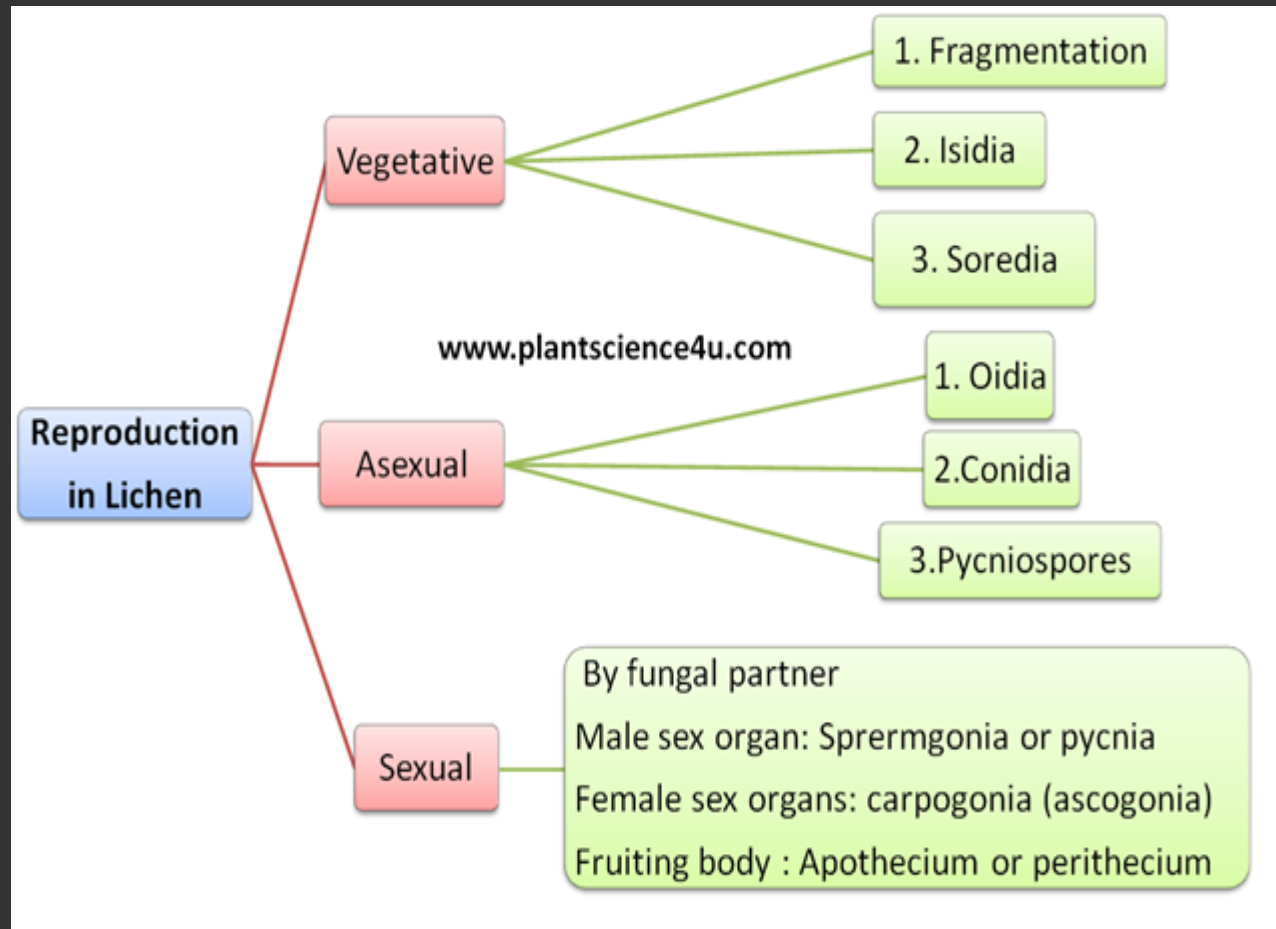


DIBAEIS

dimorphic - apothecia

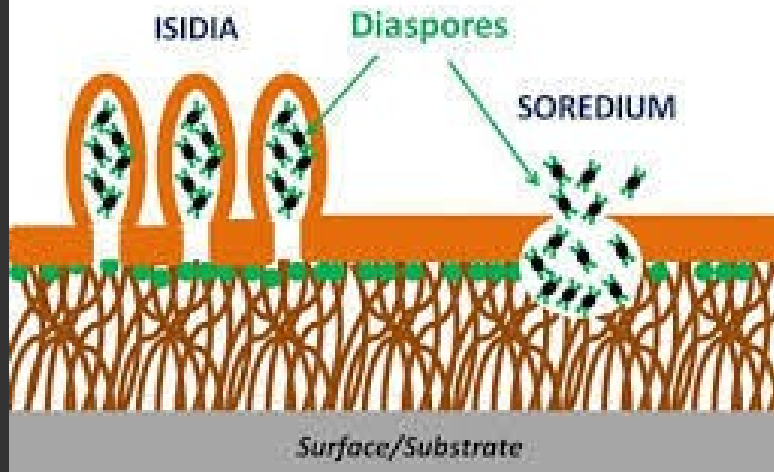


Lichen reproduction

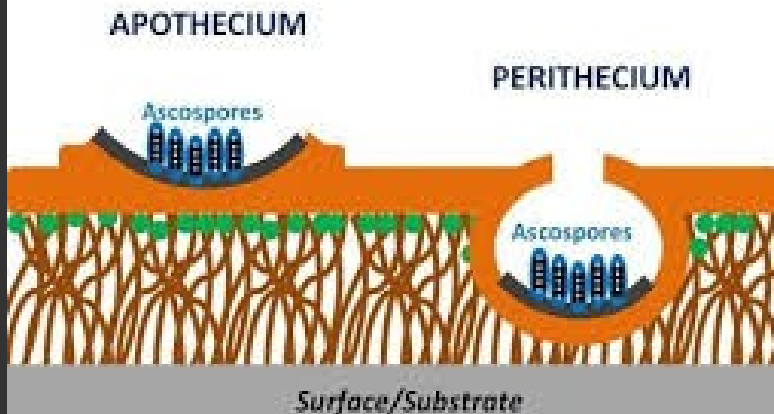


Lichen reproduction

Lichen Asexual Reproduction



Lichen Sexual Reproduction



Lichen ecology factoids:

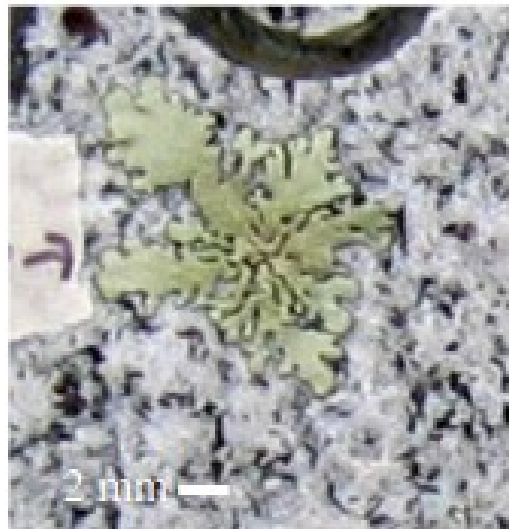
- Can grow in horrible places like exposed rocks
- Often the primary colonizers of new land (volcanic)
- Very sensitive to air pollution; can be used as air quality indicators
- Grow very slowly (~1-2 mm per year)

In a Place for the Dead, Studying a Seemingly Immortal Species



Dr. Anne Pringle





autumn 2005 (8 Nov)
intact lichen

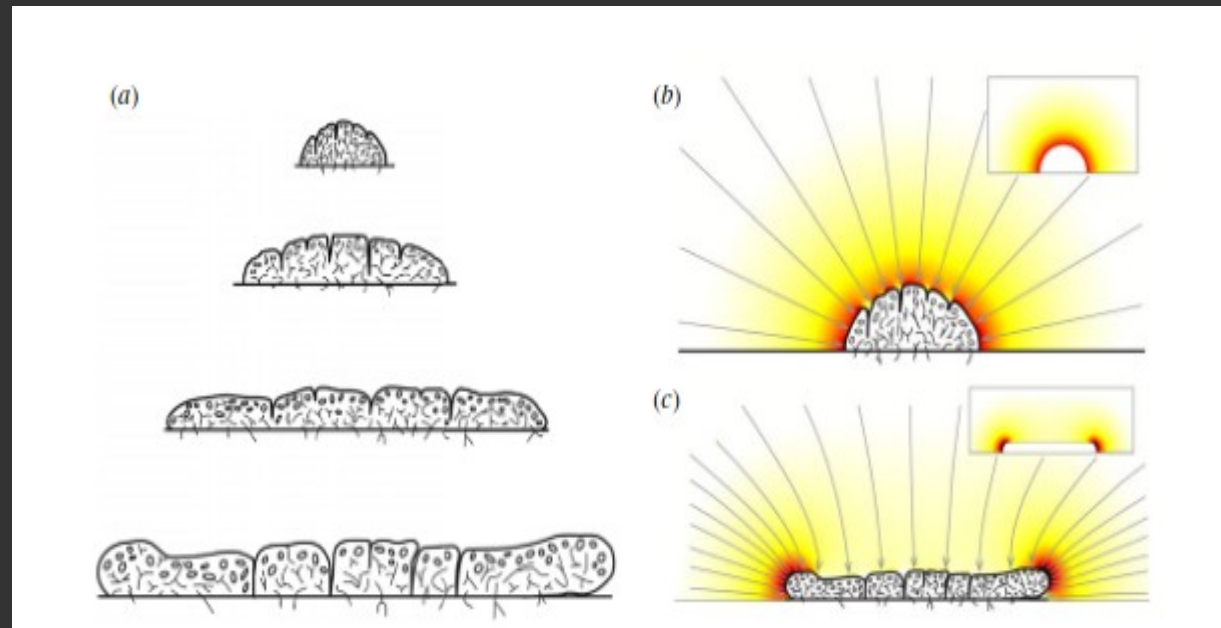


autumn 2006 (27 Sept)
fragmented lichen



spring 2007 (31 May)
*newly established
lichen is spherical*

Diffusion of CO₂ above the lichen enforces an upper limit for growth speed



Seminara et al., 2018

SUGARS

- glass formation
- protection of membranes

PROTEINS

LEA proteins
dehydrins
rehydrins

DNA

- antioxidants
- enzymes

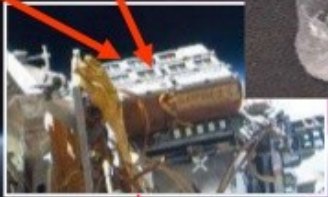
FREE RADICAL SCAVENGING

OTHER MECHANISMS

"Space Survivors"



Cyanobacteria
Lichens
Water bear
Seeds

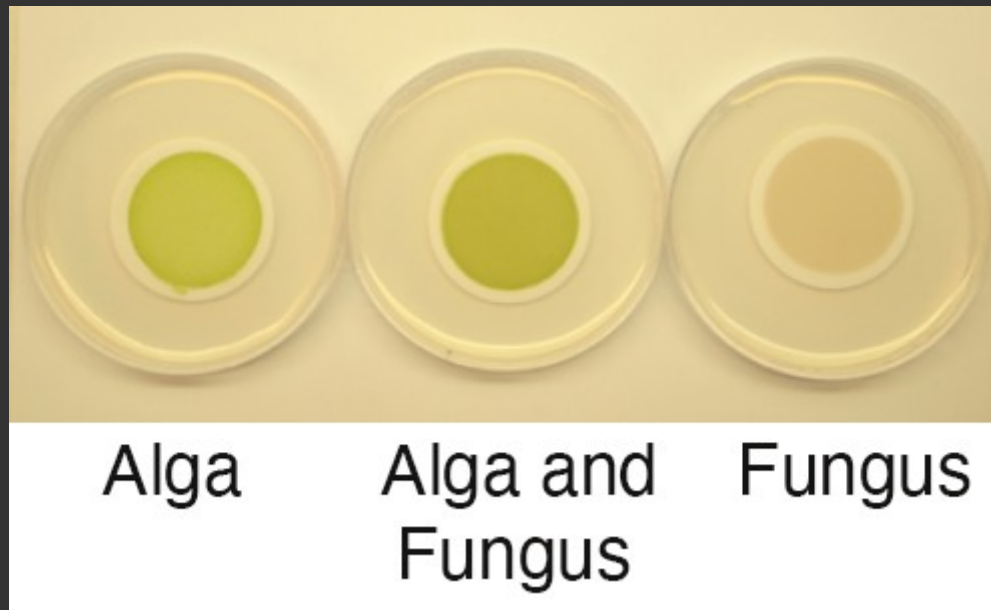


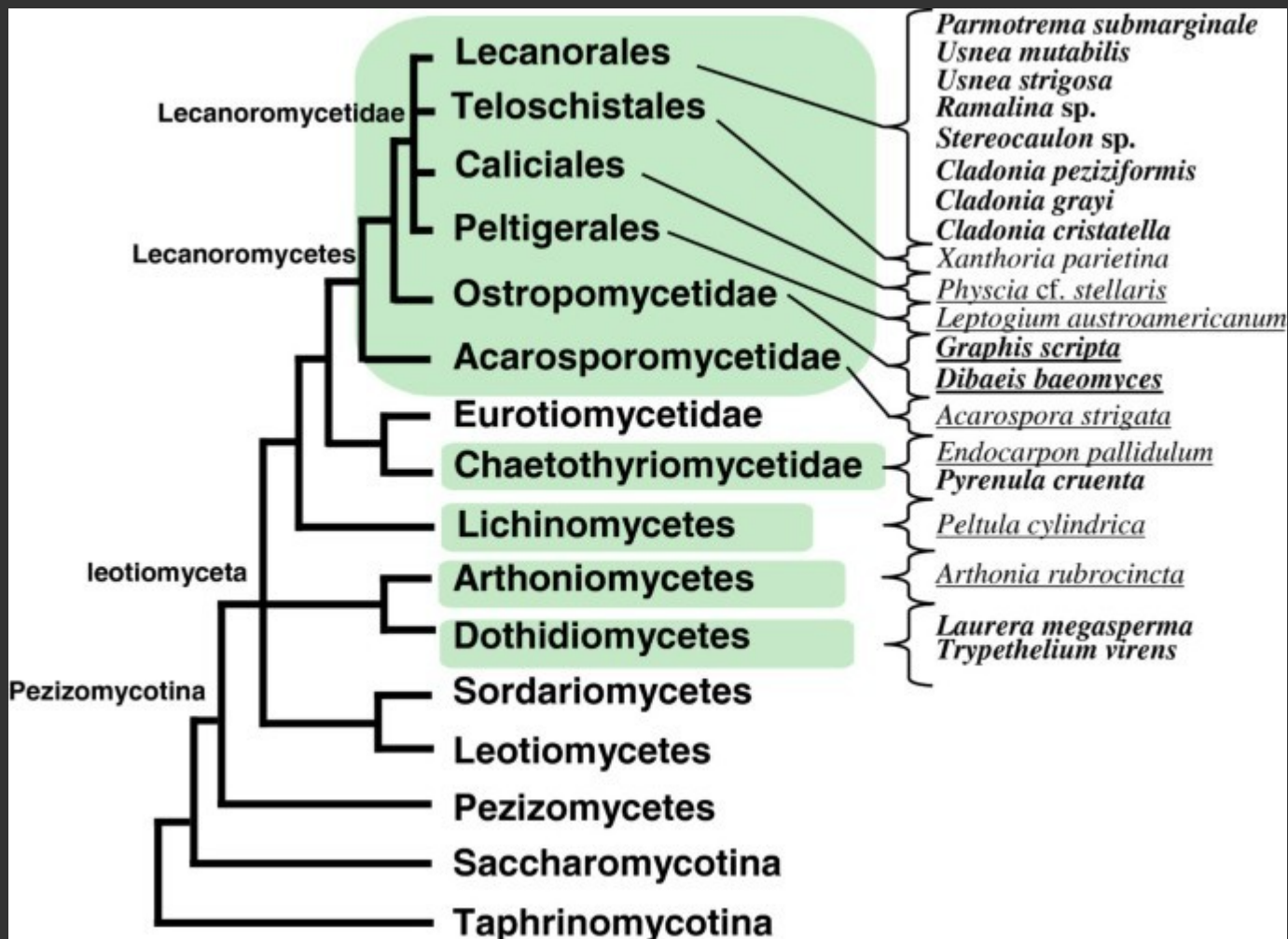
Lichens survived outer space for 1.5 years !!!



No gene transfer between symbionts!

Each can be grown separately, just fine.





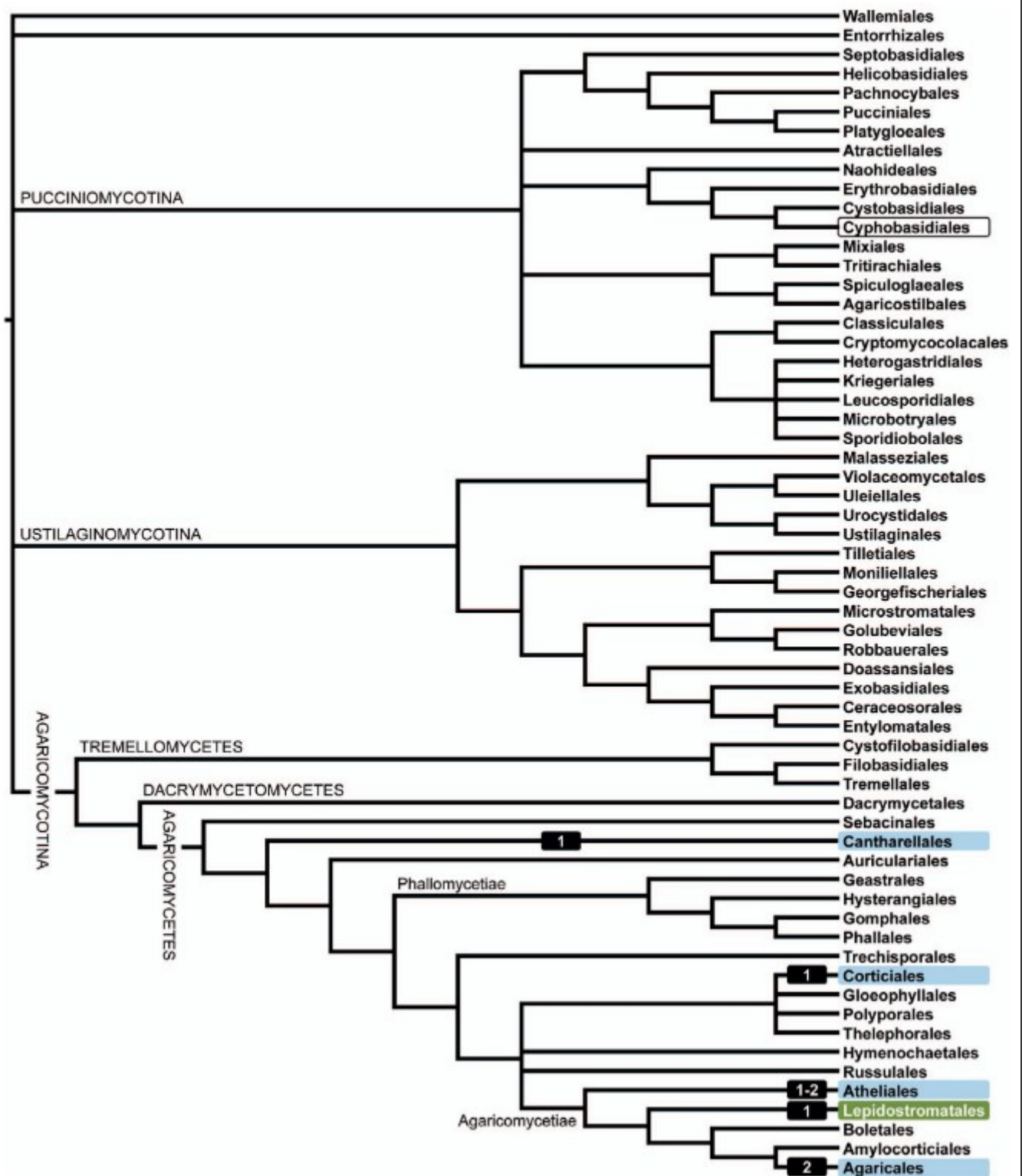
20,000 + named lichens

Have to study phylogeny via one or the other symbiont

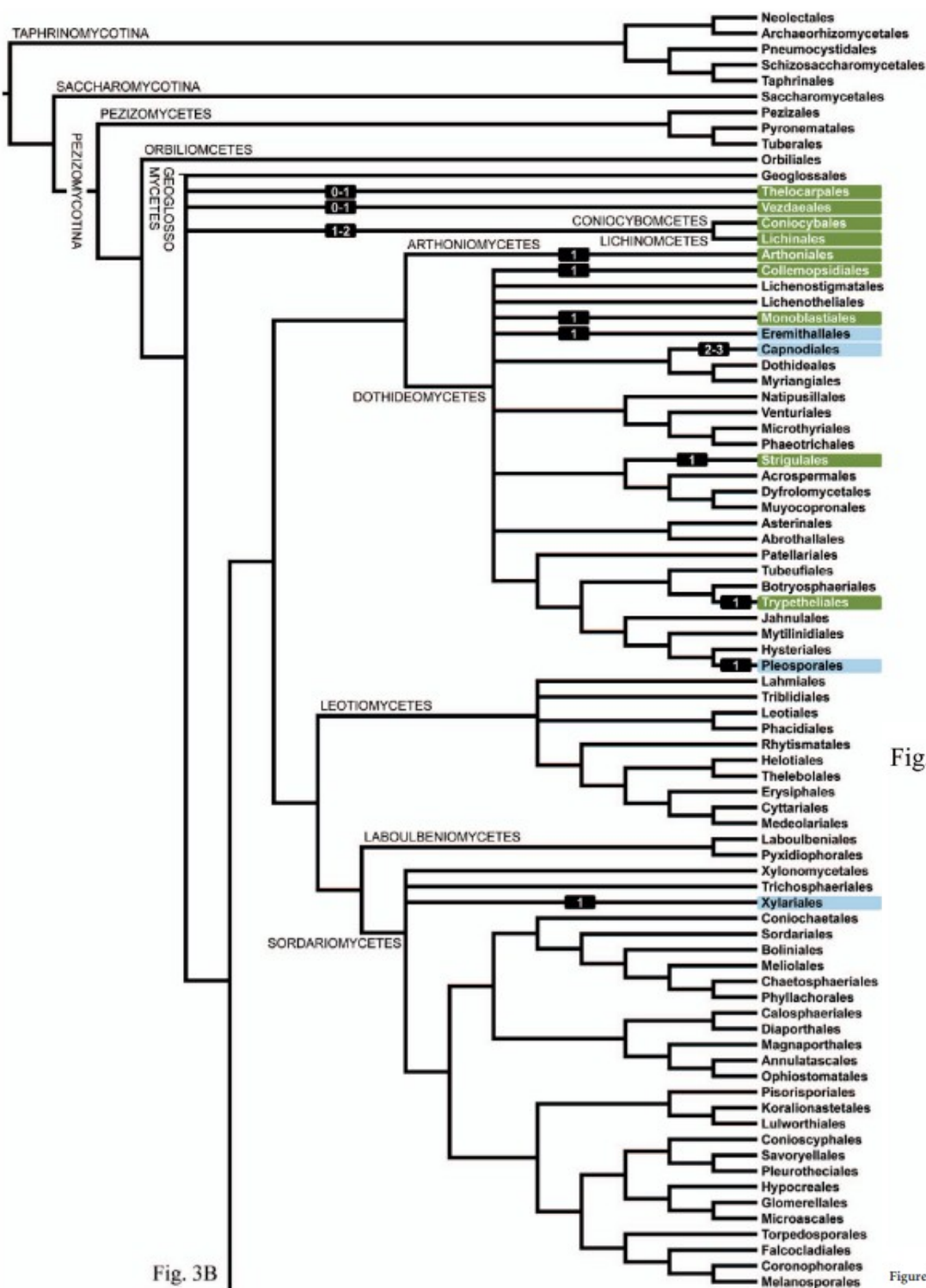
Named after mycosymbiont

Mostly ascomycota (fewer than 200 Basidiomycete species)

Lichen-forming groups in Basidiomycota

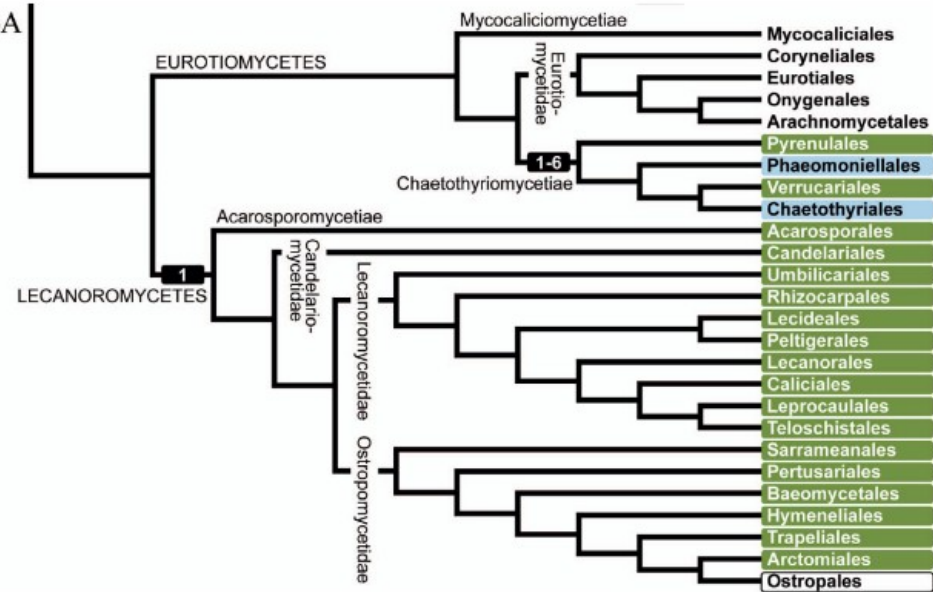


Lichen-forming groups in Ascomycota

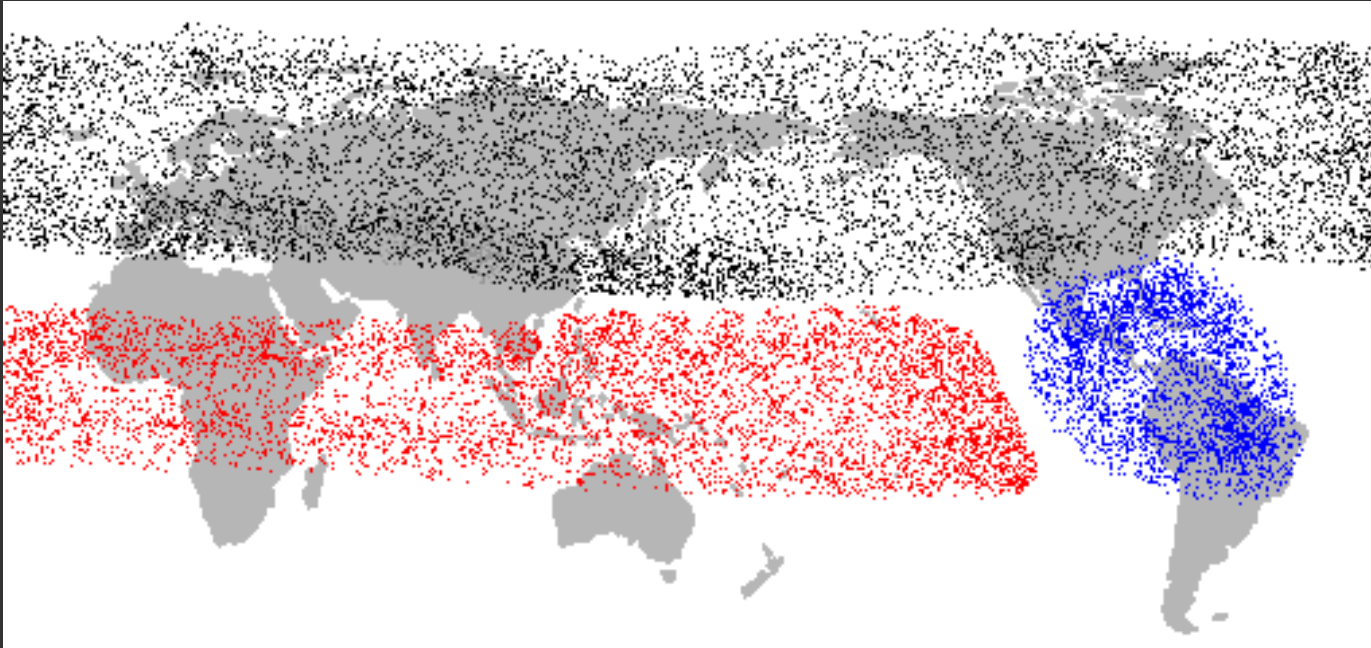


Lücking, et al, 2017

Fig. 3A

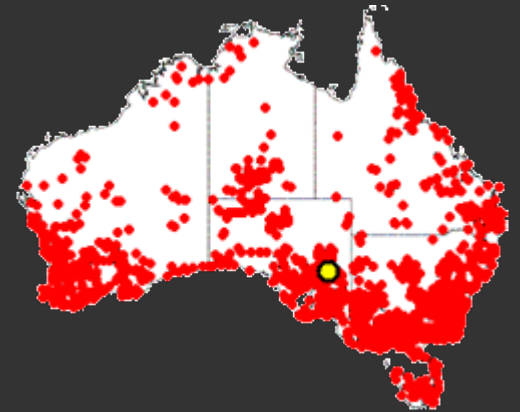


Lichen distributions

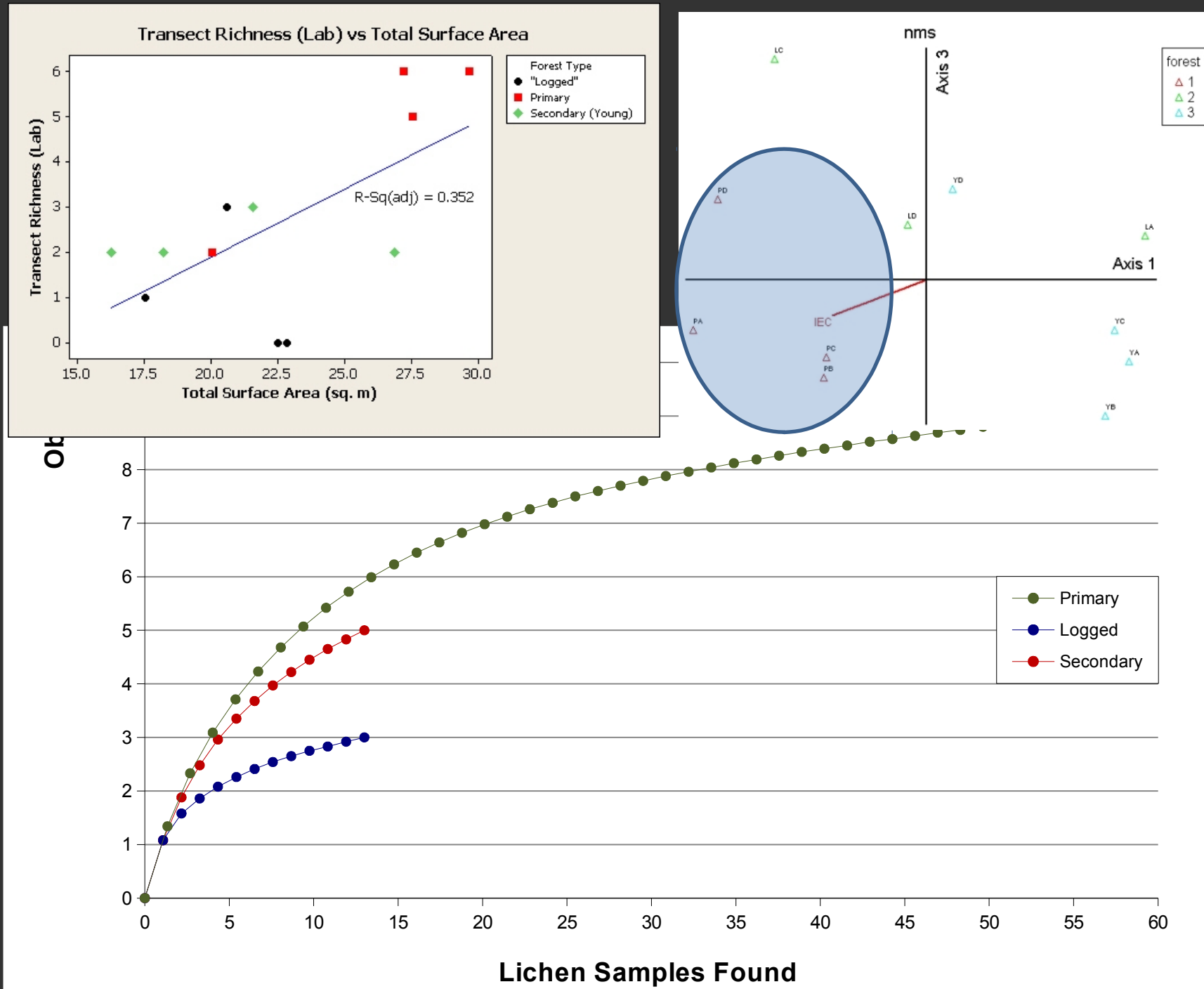


Lots of species have "limited" but giant distributions

Endemic species



Lichen surveys can be used as a stand-in for lots of conservation measures





Assignments

1. Keep working on your lab assignments
2. Read [Spribille et al., 2016](#)
3. Quiz over reading before class Thursday