Survey of soil arthropods

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Background

Goal: a biological survey of **soil mesofauna** (and some macrofauna)

Mesofauna: invertebrates between 0.1mm and 2mm in size

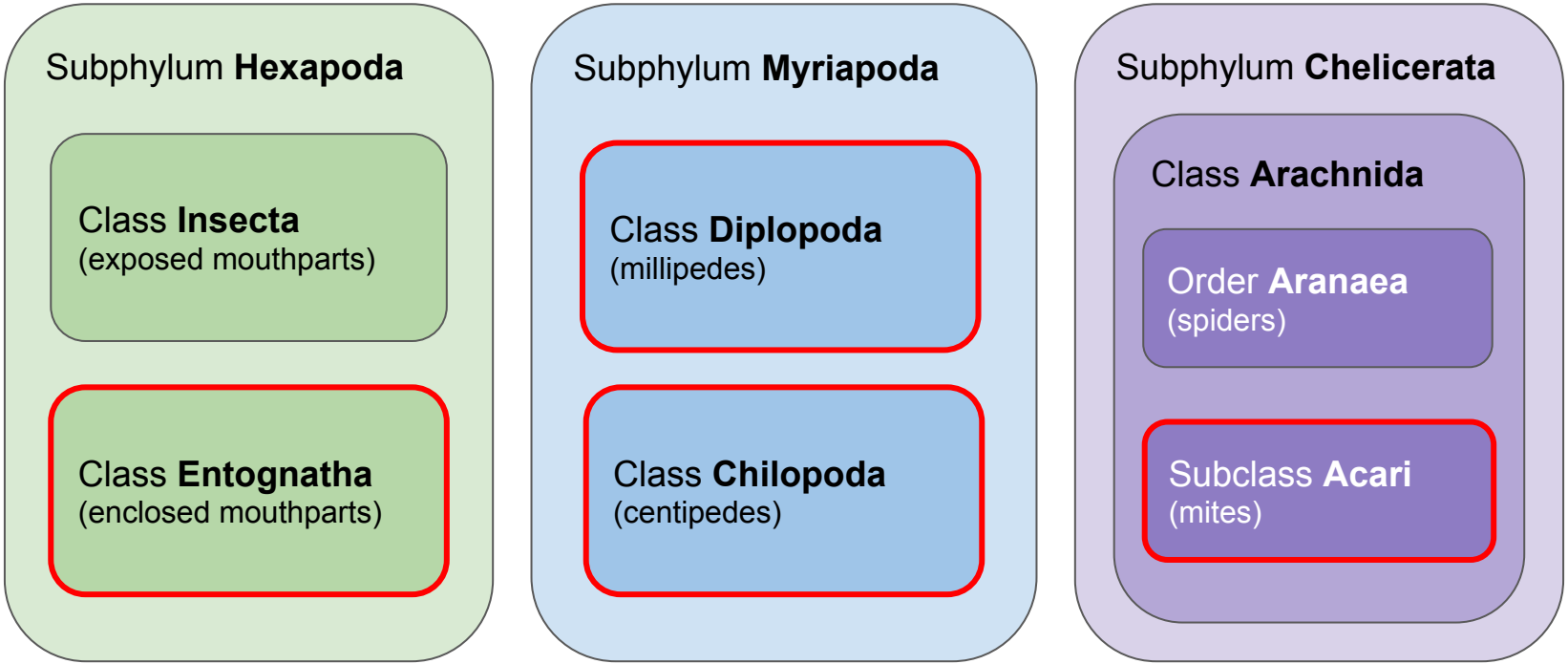
Macrofauna: larger invertebrates that can reshape soil

Motivation: highly diverse, understudied, and very interesting

Limited scope to arthropods due to personal interest

Background: Arthropod taxonomy

Phylum **Arthropoda**



Materials & Methods

Berlese-Tullgren funnel:

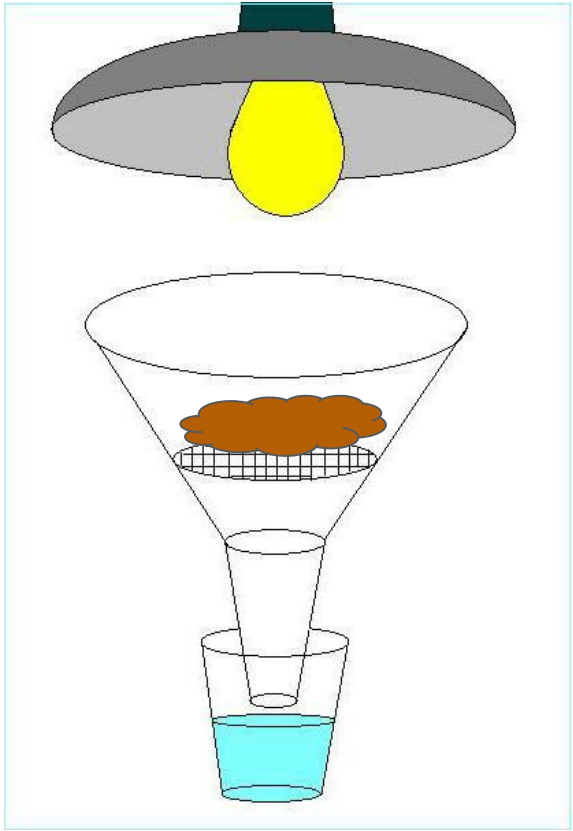
light bulb heats and desiccates soil

mesofauna flee downward

mesofauna fall through mesh & into alcohol

Soil sources:

Chestnut Hill Reservoir,
Newton Campus,
University of Southern Mississippi



Methods

Berlese funnel in action

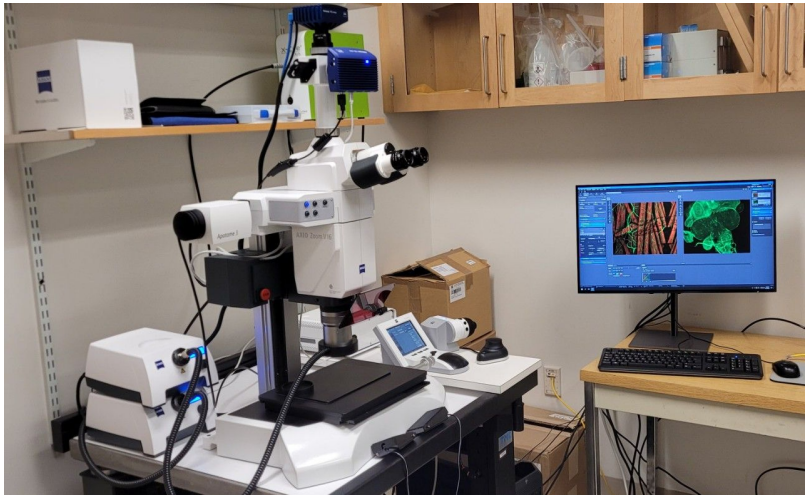
Berlese funnel product

Methods

Microscopes: V16, Z2

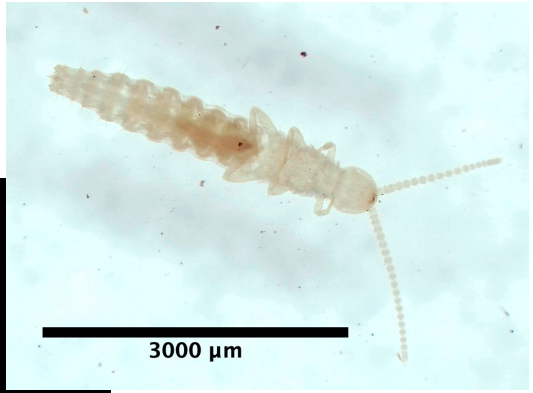
Post-processing: Extended Depth of Field plugin on ImageJ (Forster et al. 2004)

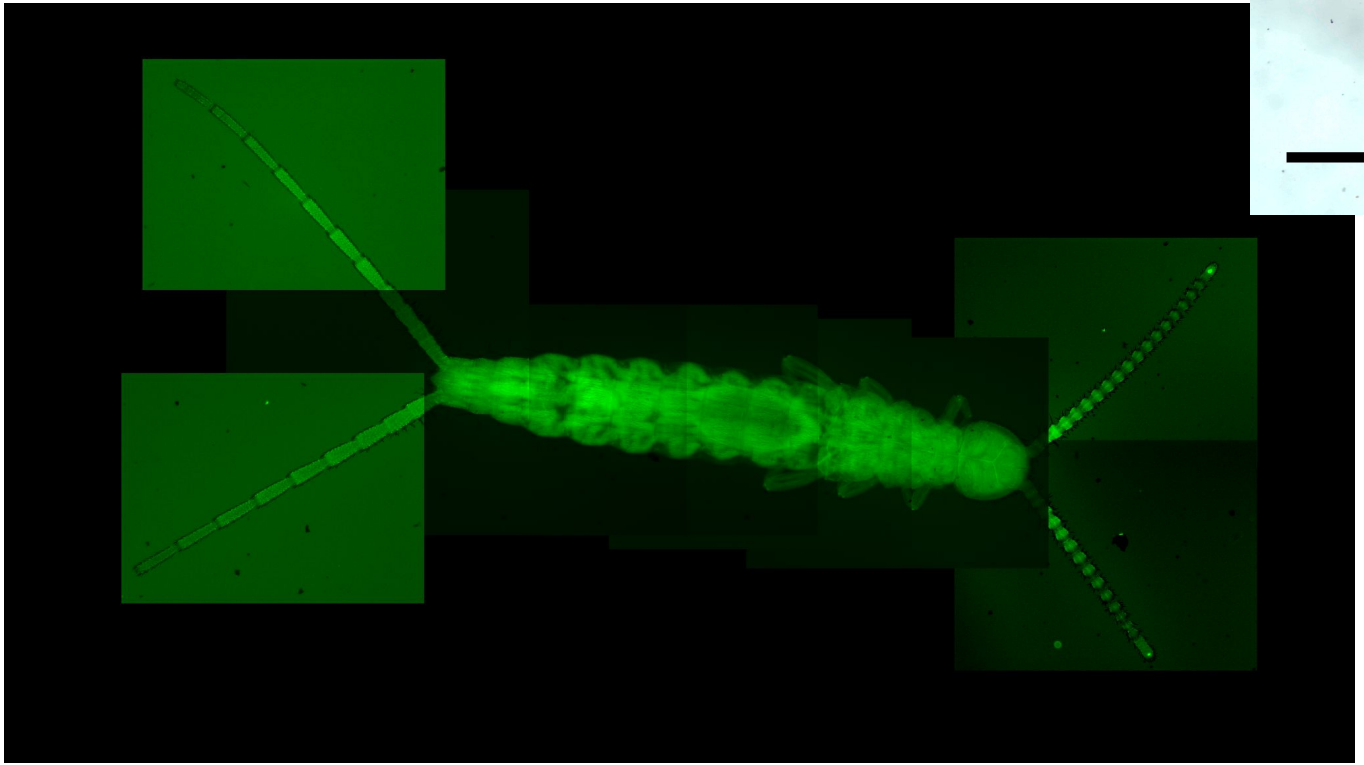
Color balance, brightness & contrast on ImageJ



I. Hexapoda

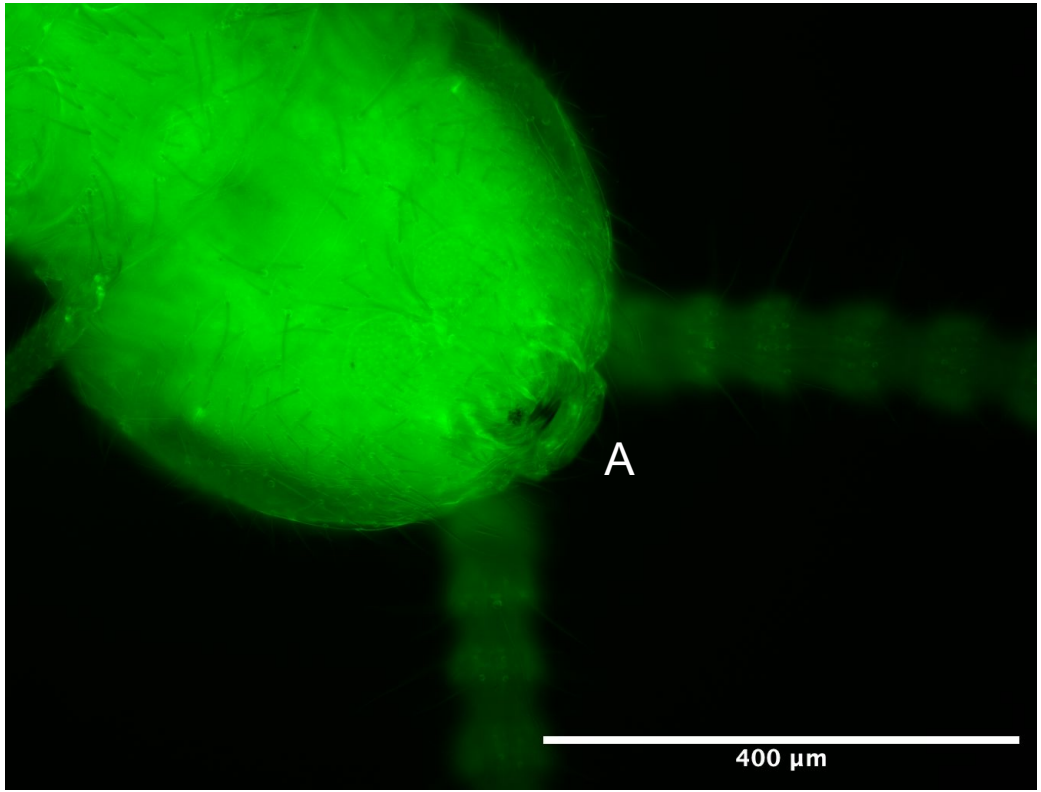
Diplura (double-tailed hexapod)





Composite image of a dipluran

Diplura



Dipluran head, ventral view. Note gnathal pouch (A)

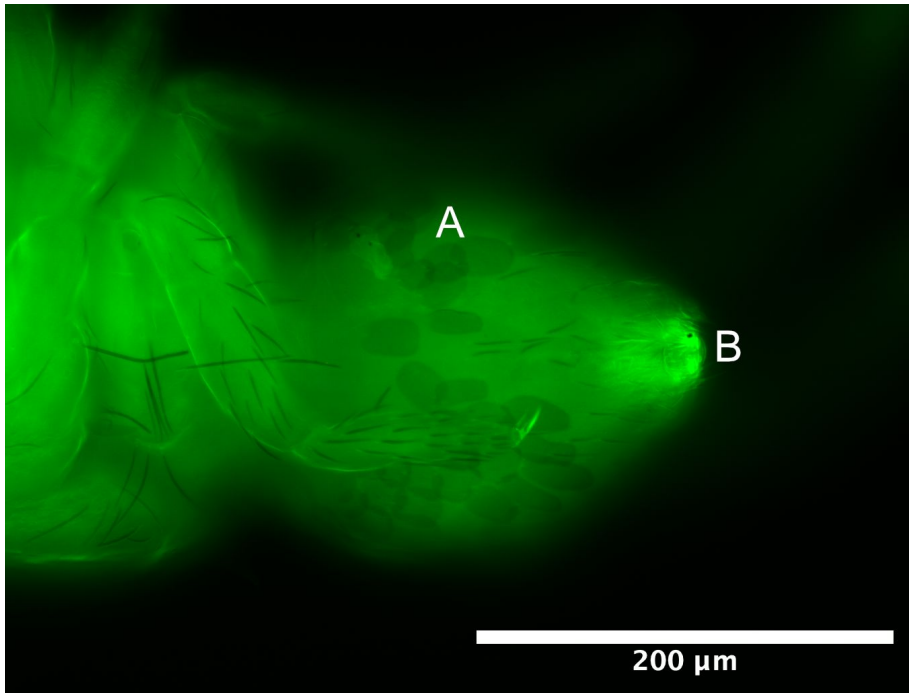
Collembola (springtails): Entomobryomorpha

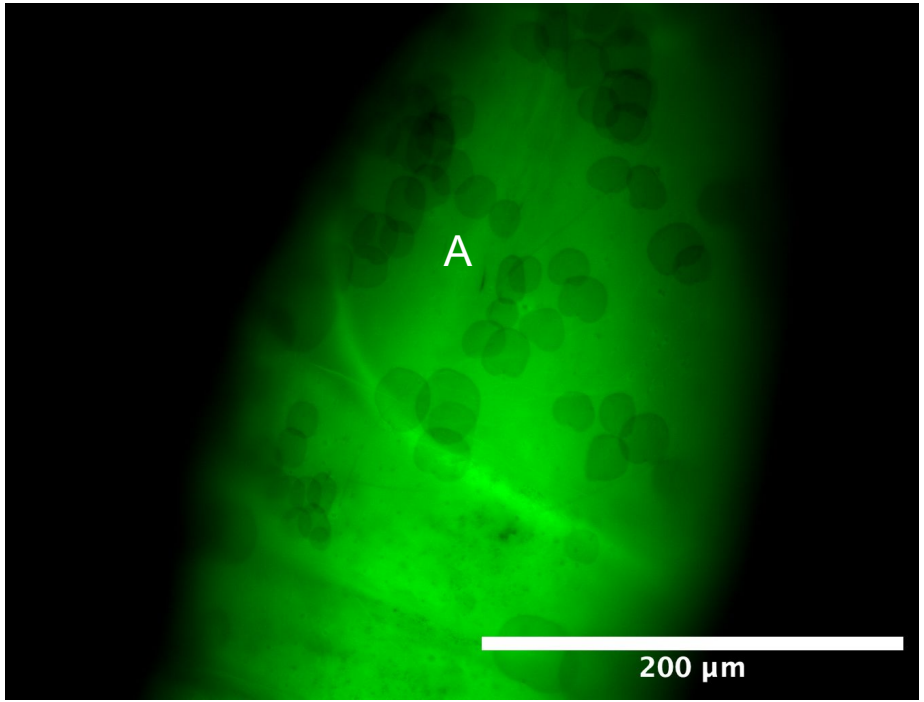
A: **furcula** or tails used for jumping

B: **collophore**—peglike structure formerly believed to help springtails to stick to surfaces

(*kolla-embolos* = glue-peg)

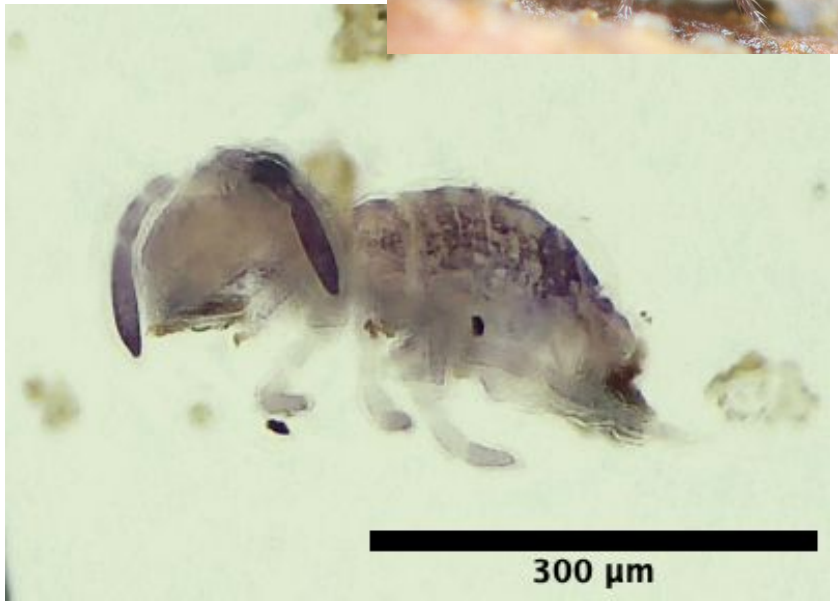
Collembola: Entomobryomorpha





Scales on springtail head and body (A). Note gnathal pouch (B)

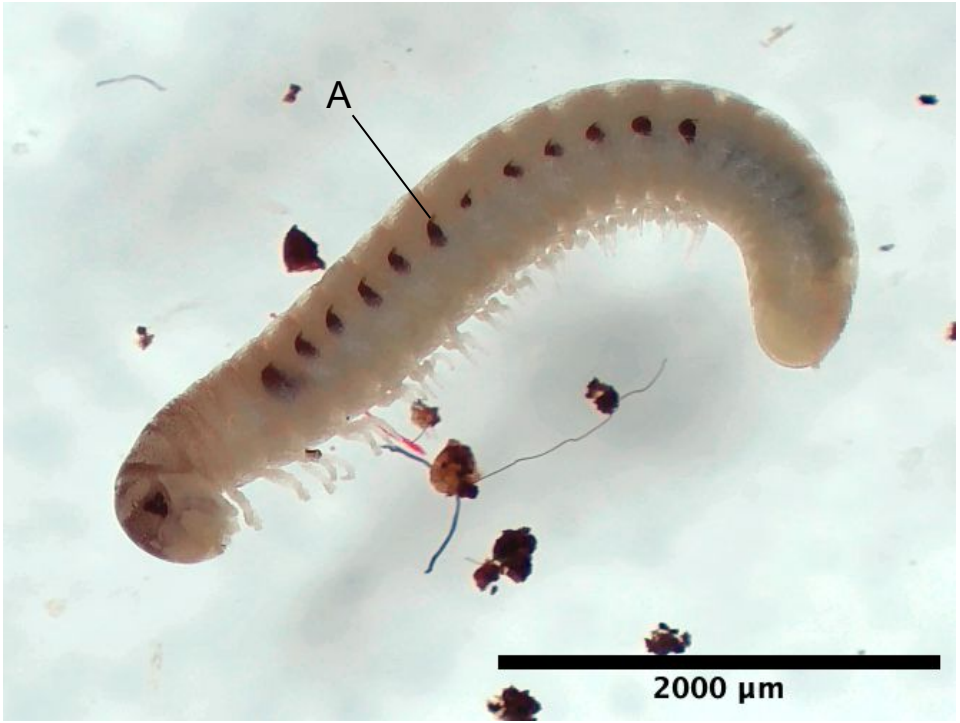
Collembola: Symphypleona



Dorsal and ventral views of Symphypleonans

II. Myriapoda

Diplopoda (millipedes): Julida (round-backed)

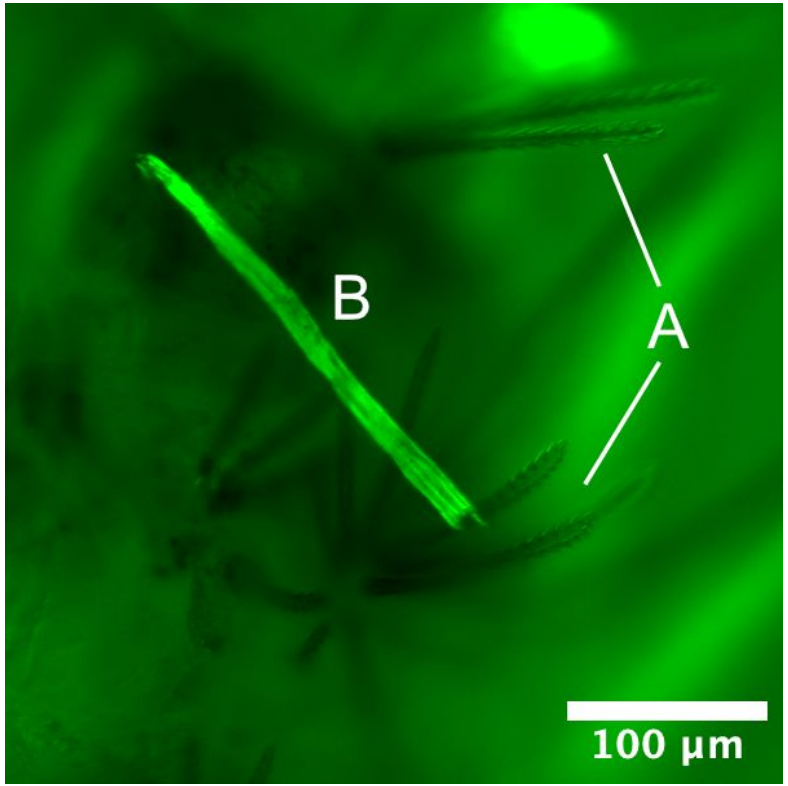


Cylindroiulus punctatus juveniles carrying rows of ozopores (A)

Diplopoda: Polyxenida (bristly millipede)

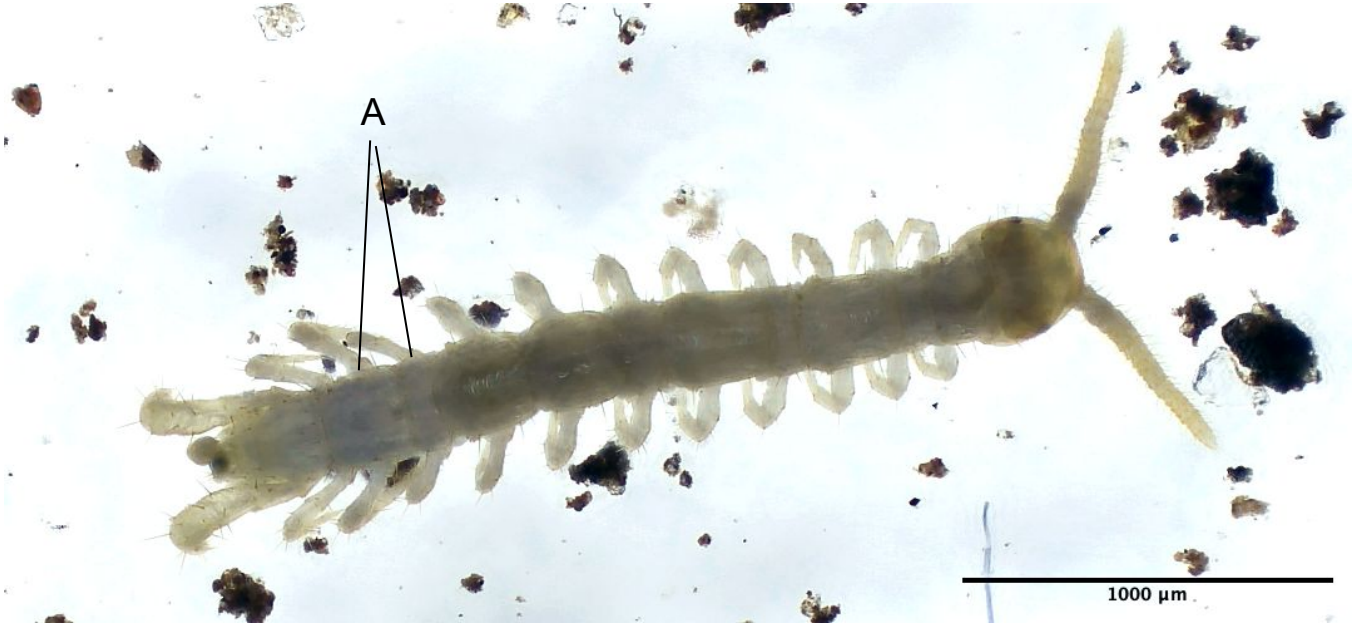
Adult bristly millipede, with no ozopores (A)

Diplopoda: Polyxenida



Polyxenid bristles (A) with an entangled piece of debris (B)

Chilopoda (centipedes): Lithobiomorpha

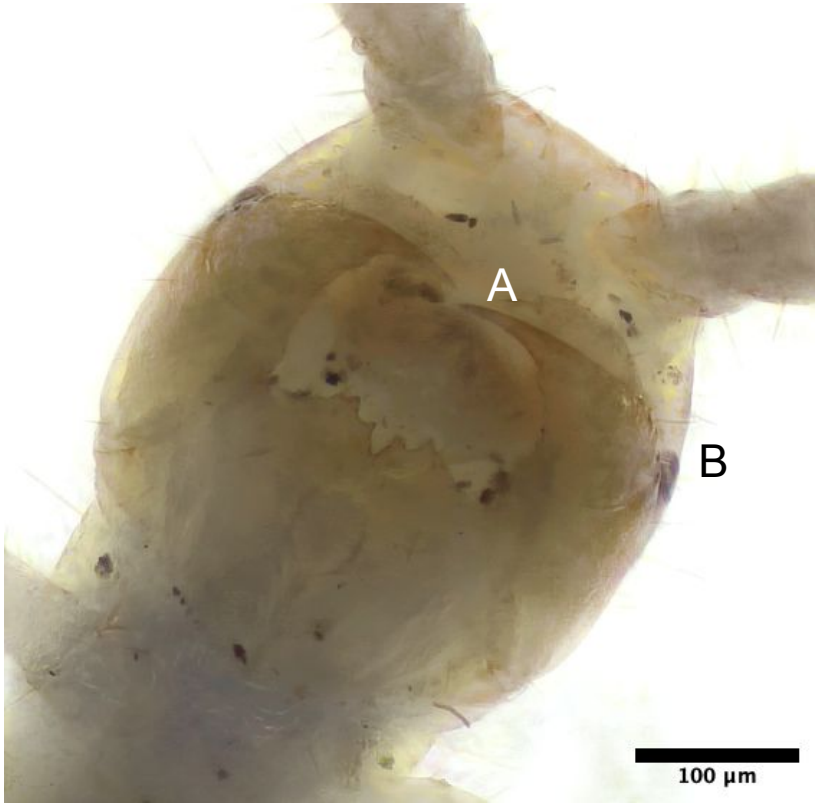


“Tergite heteronomy” (A)—body segments alternate in length

Chilopoda: Lithobiomorpha

A: **chilopods**—“jaws” of centipedes, actually legs modified to carry venom

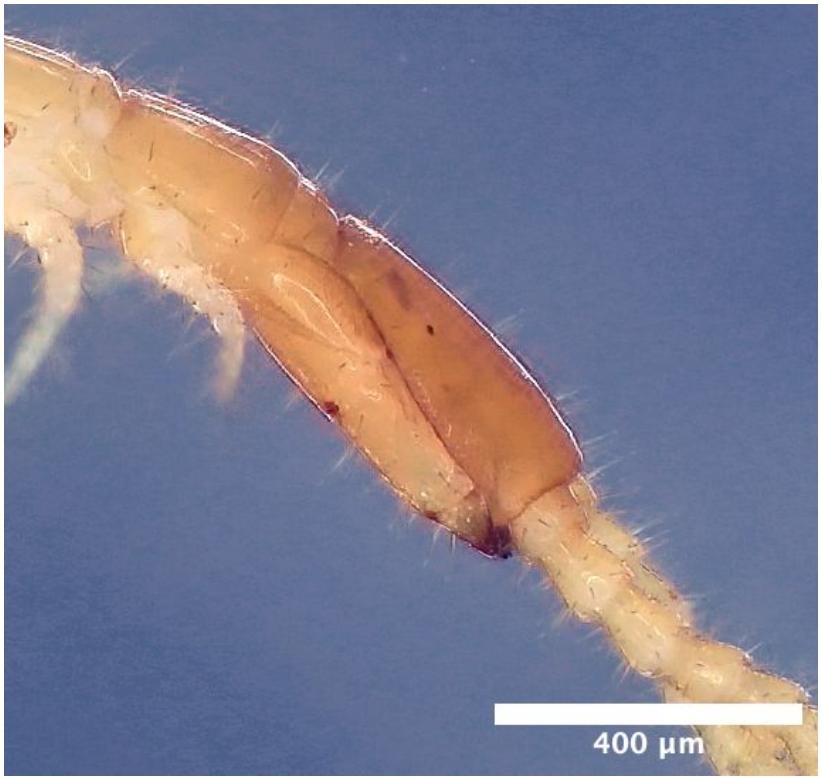
B: **ocellus** or single simple eye



Chilopoda: Geochilomorpha

Many more segments, with uniform lengths

Chilopoda: Geochilomorpha

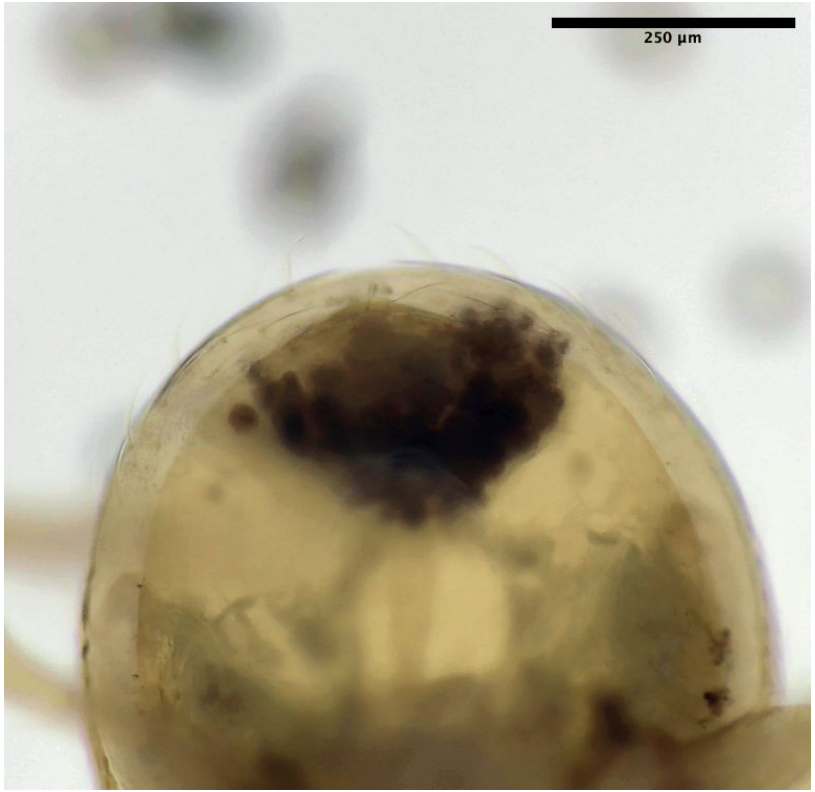


No eyes at all!

III. Chelicerata

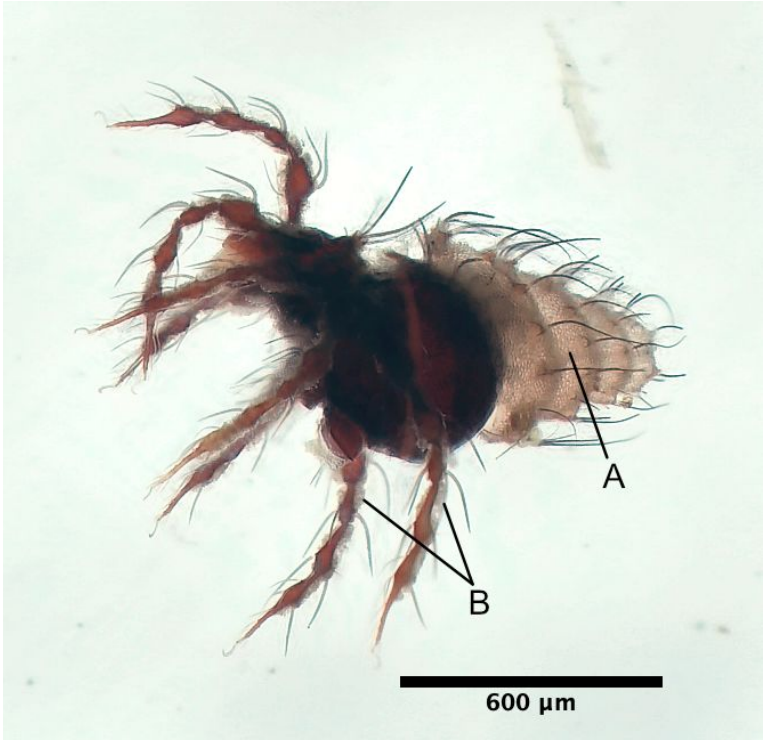
Mesostigmata (predatory mites)

Adult and juvenile



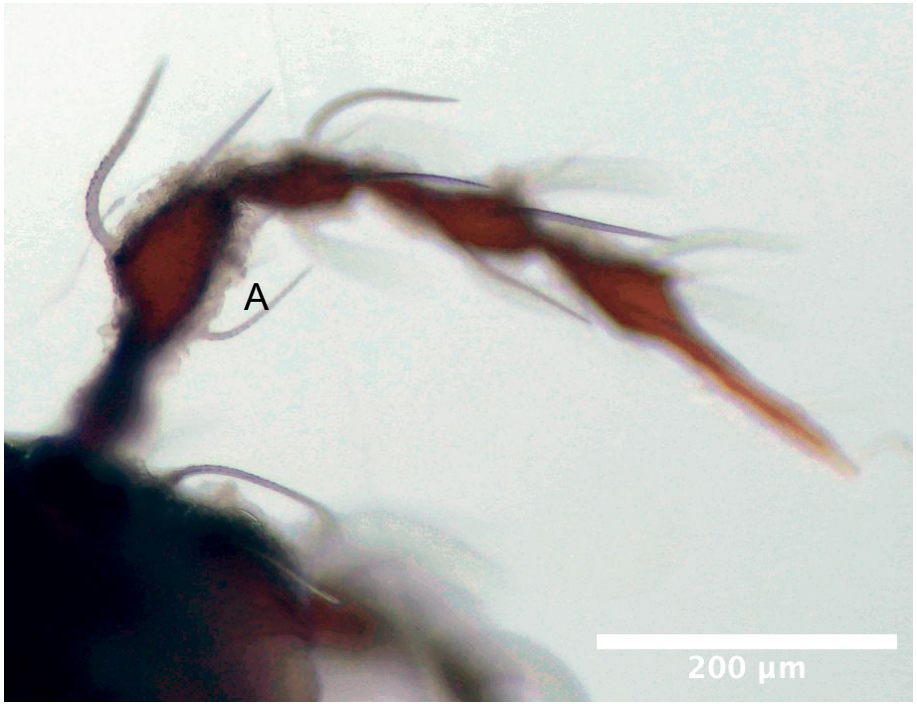
Feces?

Oribatida (“moss mites”):Damaeidae

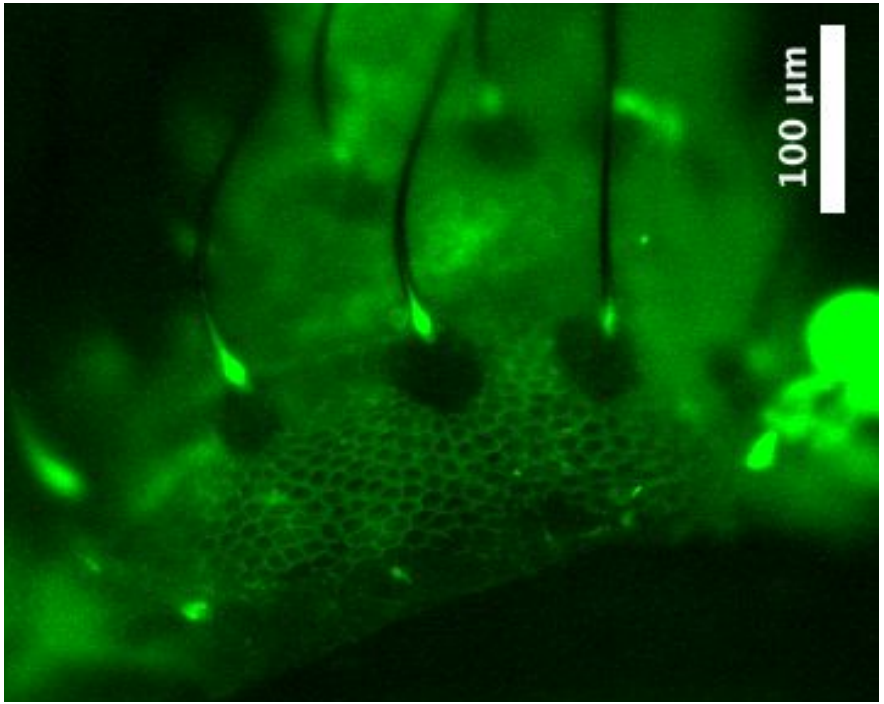


Juvenile Damaeid with exuvial scalp (A). Waxy cerotegument (B) visible.

Oribatida: Damaeidae

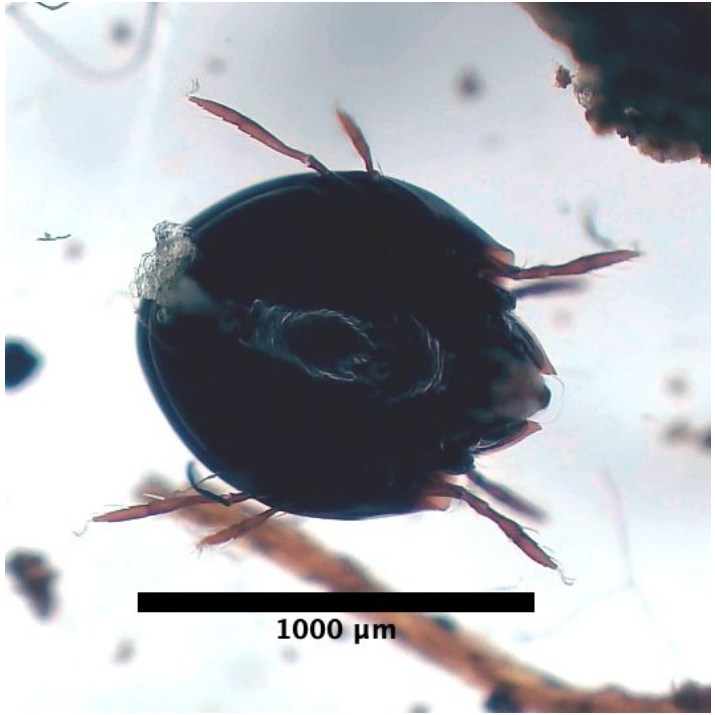


Cerotegument (A) on leg



Surface of exuvial scalp

Other Oribatida



Ceratozetidae

Phthiracaridae

Discussion

New England forest soil appears richer in mesofauna

→ well-aerated & coarse vs. densely-packed Mississippi mud

Challenges:

Lamp accidentally cooked soil → naphthalene (moth balls)?

Alcohol evaporation under Z2 → glycerin?

Specimen drift under V16 → gels?

Future directions:

Assessment of biodiversity across soil types; leaf litter types

Finer diagnoses of springtails & mites, to eventually look at species diversity

Imaging of live mesofauna to document life histories

Questions?