Lab 8:
Moths, Mites, and Ears

Today's Lab

1. Progress check

2. Background Powerpoint

3. Screen moths for *Dicrocheles* mites

Wait, moths have ears?

Yup!

Tympanal organs capable of sound detection have actually evolved multiple times in moths.

As such, different groups have “ears” of different capacities and on different points of their bodies.

Noctuidae moths-on both sides of their body, near the base of the wing

Today they help noctuids avoid bat predation, but the structure actually evolved prior to bats (Kawahara, 2019).

Wait, there are mites in moth ears?

Also yup!

3 species known to NA, all members of the genus *Dicrocheles,* all live colonially inside tympanal organ

1. *D. phalaenodectes* – widespread in North America, infects one ear only, burrows through tympanum, probably deafening moth in that ear. Common in SC
2. *D. scedastes* – until 1974, known from Old World only; 1974-now, east coast of US, too; infects both ears, but often doesn't pierce tympanum, effect on hearing totally unknown. Seems to have showed up in 1975 in SC
3. *D. hippeoides* – known only from one colony in one moth found in Baton Rouge, LA – in one ear, but never found again, no information at all.

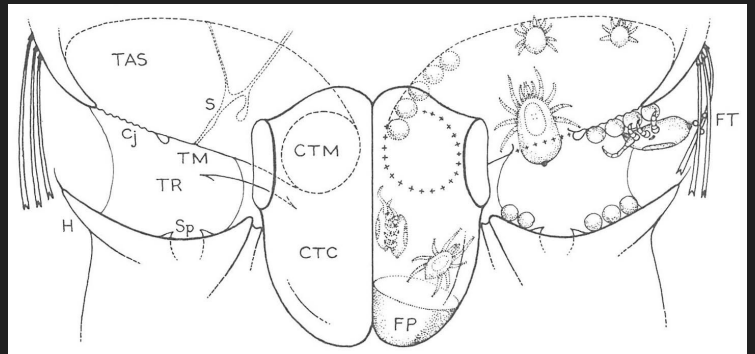


Figure 73. Schematic dorsal view of noctuid tympanic organs showing unilateral occupancy by *Dicrocheles phalaenodectes*. *Cj*, conjunctiva; *CTC*, countertympanic cavity; *CTM*, countertympanic membrane; *FP*, fecal plug; *FT*, fecal hair thatch; *H*, hood; *S*, scoloparial sensillum; *Sp*, spiracle; *TAS*, tympanic air sac; *TM*, tympanic membrane; *TR*, tympanic recess.

from Treat 1975

What we already know (and what we don't!)

Most of our info about these species comes from Asher Treat

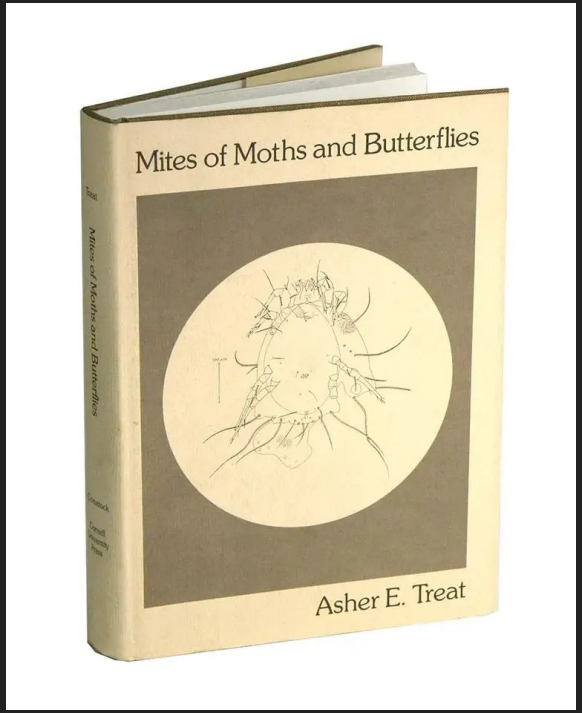
Screened for infection, described the genus, and maintained colonies in the lab

We have positive counts on a number of species.

BUT… No negatives!

Why might this be a problem?

We're still discovering many species that can host *Dicrocheles* in the wild.



Our Data

100+ specimens of potential host moths collected from 1965-1976 across SC (mostly near the coast).

Also have many hundreds of specimens collected biweekly from 2023-2024 across SC reserves (Lo Presti Lab)

In known hosts, infection rate is generally low but highly variable across time and space (Hadinidae, all spp: 365 none, 19R, 21L, 8B – but high midsummer – 50% in some traps)

Today, we'll be looking at some Noctuid moths collected in Northern Texas, which should have a reasonably high mite burden.

How do I screen a moth for Dicrocheles infection?

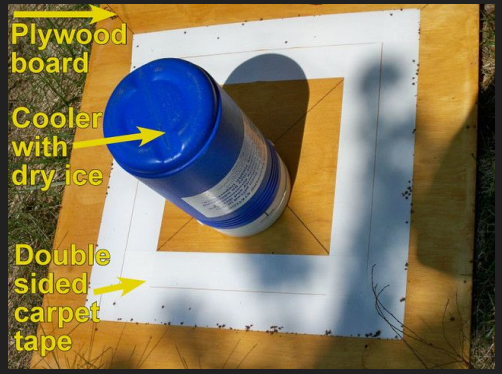
1. It’s easiest to look inside the ears with the moth mounted on a piece of foam. Cut a foam square, and use an insect pin to affix the moth to the side
2. The wings will often be in the way; pinning them up above the moth’s head is often easiest
3. Look inside the tympanic recess; infected moths should have visible adult and larval mites, as well as lots of feces
4. Make sure to check both ears, as the most common species will only infect one!
5. Record your data in the class google sheet

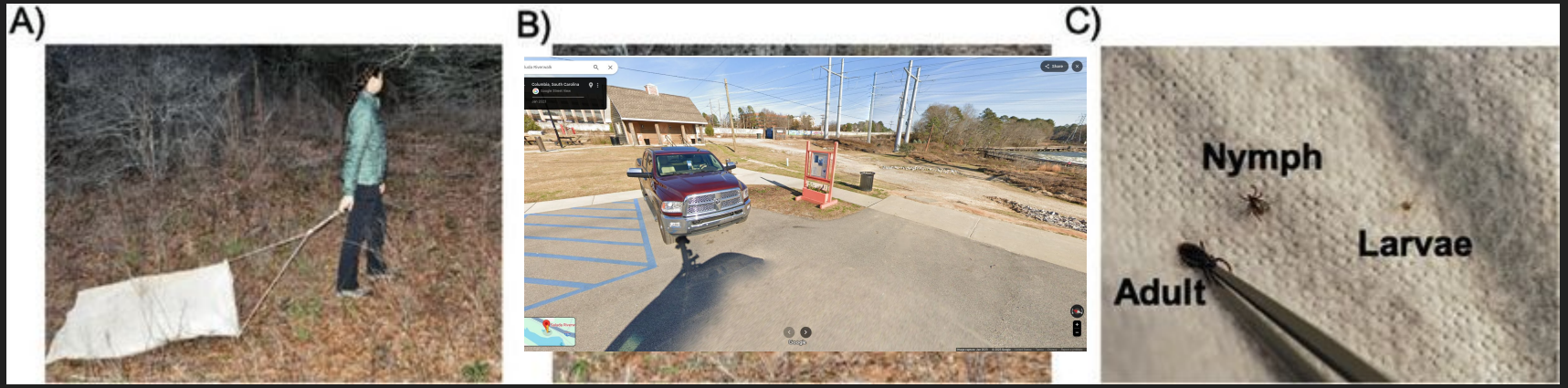
Next Week

Field Trip!

Meeting at the Saluda Riverwalk

Tick-sampling!





Sources

Kawahara, A. Y., Plotkin, D., Espeland, M., Meusemann, K., Toussaint, E. F., Donath, A., ... & Breinholt, J. W. (2019). Phylogenomics reveals the evolutionary timing and pattern of butterflies and moths. Proceedings of the National Academy of Sciences, 116(45), 22657-22663.

Treat, A. E. (1975). Mites of moths and butterflies. Comstock Publishing Associates, Cornell University Press.