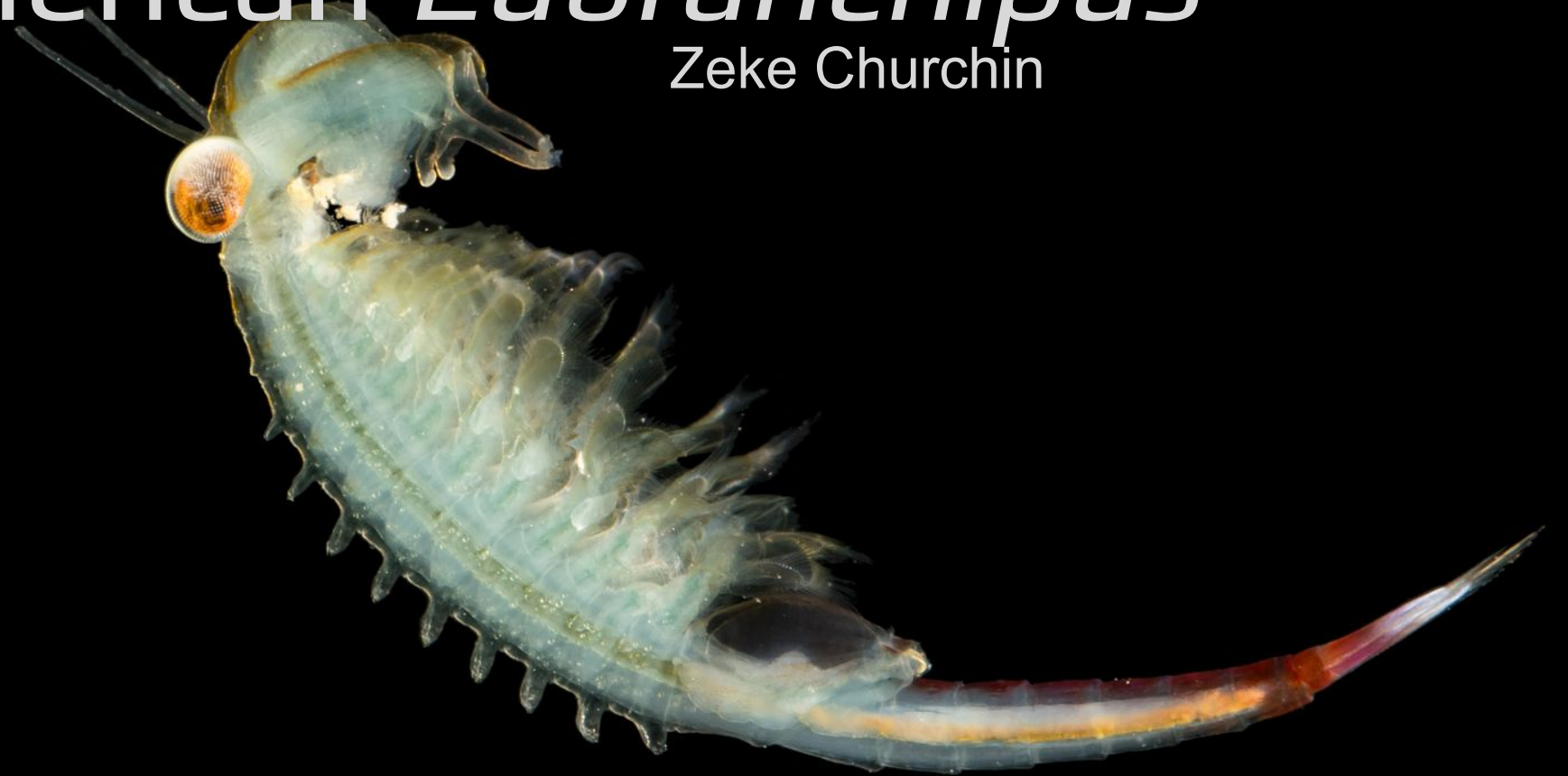


# Genetic Study of the North American *Eubranchipus*

Zeke Churchin



-Phylum: Arthropoda (Crustacea)

-Class: Branchiopoda

-Order: Anostraca (Fairy Shrimp)

-Family: Chirocephalidae

Genus: *Eubbranchipus*



Tadpole Shrimp (Notostraca)



©lan Gardiner

Clam Shrimp  
(Spinicaudata)



© Eric C. Maxwell

Fairy Shrimp (Anostraca)



Water Fleas (Cladocera)



© Eric C. Maxwell

# Global Anostracan (Fairy Shrimp) Diversity

- Found on all seven continents
- 356 described species worldwide
- 32 valid genera
- *Streptocephalus* most diverse genus (62 species)
- Can be found in a wide variety of habitats
  - Vernal pools
  - Carolina bays
  - Rock outcrop pools
  - Hypersaline lakes



# *Eubbranchipus* Overview

- Twenty-one described species worldwide
- Eleven in North America/the US
- Recorded from all 49 continental States



*Eubbranchipus grubii* (male and female) from Denmark

## -North American *Eubbranchipus*

- Eubbranchipus serratus*
- Eubbranchipus hesperius* 2014
- Eubbranchipus ornatus*
- Eubbranchipus stegosus* 2004
- Eubbranchipus moorei*
- Eubbranchipus holmanii*
- Eubbranchipus vernalis*
- Eubbranchipus neglectus*
- Eubbranchipus bundyi*
- Eubbranchipus intricatus*
- Eubbranchipus oregonus*
- Eubbranchipus nsp. 1* 2024
- Eubbranchipus nsp. 2* 2025

## -Eurasian *Eubbranchipus*

- Eubbranchipus asanumai* 2018
- Eubbranchipus hatanaki* 2018
- Eubbranchipus hankoi*
- Eubbranchipus khankanus* 2018
- Eubbranchipus uchidai*
- Eubbranchipus grubii*
- Eubbranchipus vladimiri*
- Eubbranchipus rostratus*
- Eubbranchipus birostratus*
- Eubbranchipus claviger*

# Ohio's Large Branchiopods



*Eubranchipus bundyi*



*Cyzicus* sp.



*Lynceus brachyurus*



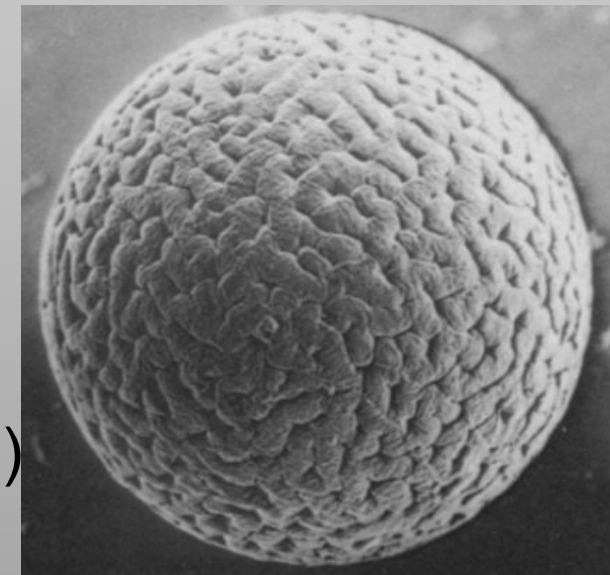
*Eubranchipus holmani*



*Eubranchipus neglectus*

# Life History

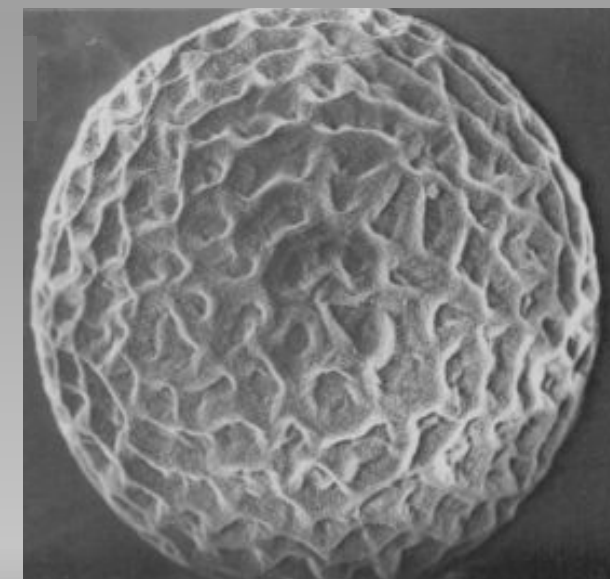
- Eggs can remain dormant for 1, 10, 100, ...years
- Small proportion of eggs hatch in any given year
- Often dispersed via waterfowl
- Eggs require “overwintering” period to hatch (wet and cold)
- Filter feeders (detritus, algae, zooplankton)
- Adults require low water temperatures and low TDS
- Co-occurrence is uncommon



*E. neglectus* egg



Co-occurring *E. bundyi* and *E. serratus* from Chicago



*E. moorei* egg

*Eubranchipus* are truly **vernal** species!

- Vernal Pools
- Ephemeral Oxbows
- Carolina Bays
- Prairie Potholes
- Roadside Ditches (without salt)

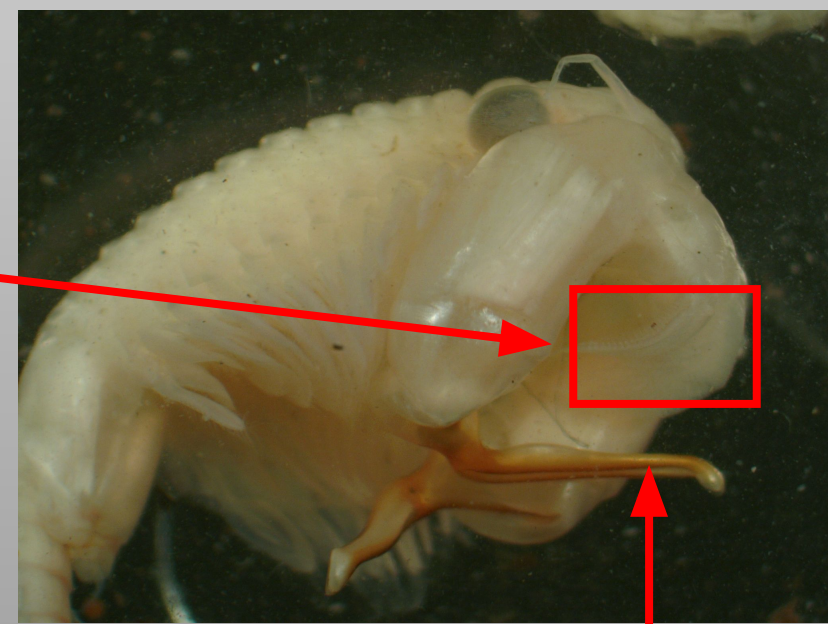
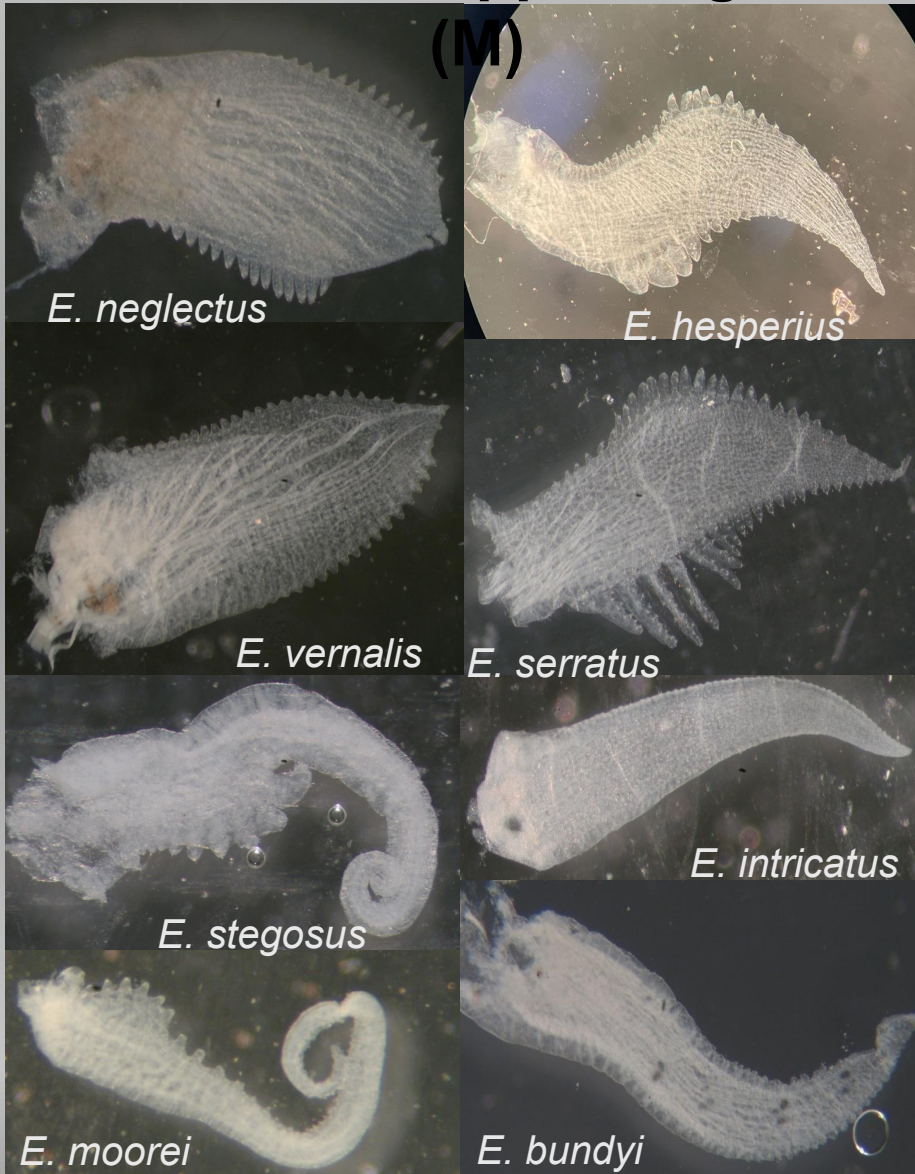


*Eubranchipus* habitat from TN (top left), VA (top right), and PA (bottom)

# Identifying Traits

## Antennal Appendages

(M)



Male *E. vernalis*

## Ovisac (F)



Female (above) and male (below) *E. neglectus*

## Second Antennae (M)





# Ohio's *Eubbranchipus* Species

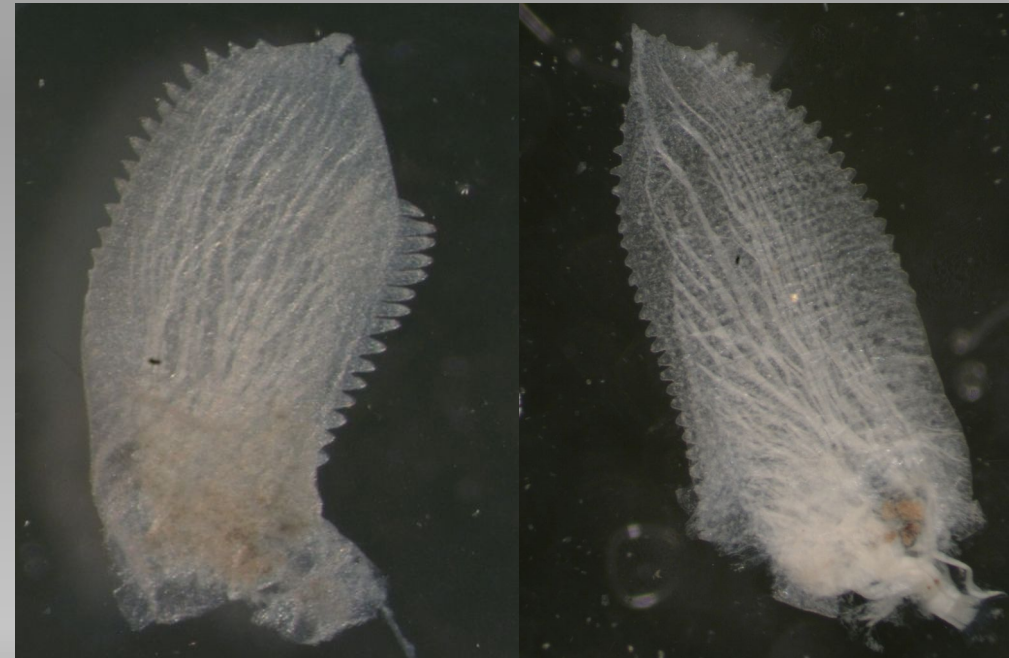
# *Eubranchipus neglectus*

(Neglected Fairy Shrimp)

- Extremely prevalent in Ohio
- Found throughout the state
- Found in Central North America, \*mostly\* west of the Appalachians to eastern Arkansas

## Identification

- Short, unevenly adorned antennal appendages
- Long second antennae



Antennal appendages of *E. neglectus* (left) and *E. vernalis* (right)

# *Eubranchipus bundyi*

(Knobbed Lip Fairy Shrimp)

- Relatively rare in Ohio, with a observed decline in populations
- Listed as state threatened in Ohio
- Most widespread species on the continent
- \*Mostly\* northern (possibly glacially influenced) distribution

## Identification

- Long, bare antennal appendages with a curl
- Short second antennae, with tricuspid tips
- Females with “wing” on 10<sup>th</sup> thoracic segment



# *Eubranchipus holmanii*

(Eastern Fairy Shrimp)

- Rare in Ohio
- Large range centered around the interior highlands
- Sparse records throughout distribution
- Sister species (*E. moorei*/*E. stegosus*) found below the fall line

## Identification

- Long, tentacular antennal appendages with a lamellar base
- Short second antennae
- Females have a slightly elongate ovisac



©Helen Czech



©Misha Zitser

# Potential Occurrences

# *Eubranchipus serratus*

(Ethologist's Fairy Shrimp)

- Found throughout the eastern half of the US Plains Region (disjunct pop. in VA/MD)
- Found ~100 miles west of Ohio
- Sister species with *E. hesperius* (Western US)

## Identification

- Large, broad, and heavily adorned antennal appendages
- Thick “serrated” abdomen on females
- Broad telson on both males and females



Telson



# *Eubbranchipus vernalis*

(Springtime Fairy Shrimp)

- Found in Eastern North America, \*mostly\* east of the Appalachians
- First described North American *Eubbranchipus* species
- Found ~60 miles east of Ohio

## Identification

- Shorter, evenly adorned antennal appendages
- Long second antennae



# Curent Study

# Field Collections

- Personal collections
- Citizen scientists
- Biologists
- University staff
- Museum collections



*E. holmani* from Northeast Georgia

# Lab Culturing

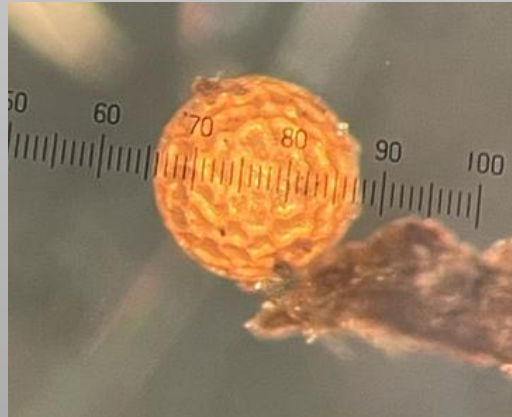
- Useful for rare or hard to encounter species (species from the southeast U.S.)

- *E. stegosus*
- *E. moorei*

- Soil collected in May 2025/March 2026

- Thirty-one 10-gallon aquaria

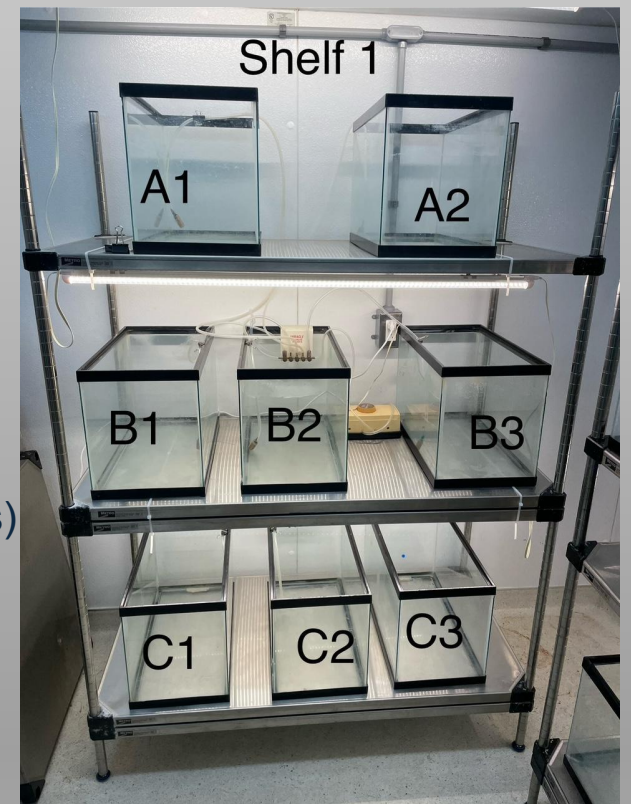
- Custom culture protocol
  - Two month “Overwintering phase” (5 C)
  - Cultures maintained at 14 C
  - No feeding



*E. moorei* egg (~250 microns)



Hatching *E. vernalis* at 100x



# Last Year's Study

- 57 volunteers made over 150 collections across 30 US states and two Canadian provinces
- All 11 North American species collected
- One known undescribed species collected (TX) and a second one discovered (VA)
- Range expansion for *E. vernalis* and *E. neglectus*
- Significant range expansion for *E. stegosus* (+170 miles and over 2.5x the known pools)
- Potential hybrid populations discovered (*E. vernalis*/*E. neglectus*)
- Preliminary CO1 *Eubbranchipus* phylogeny completed

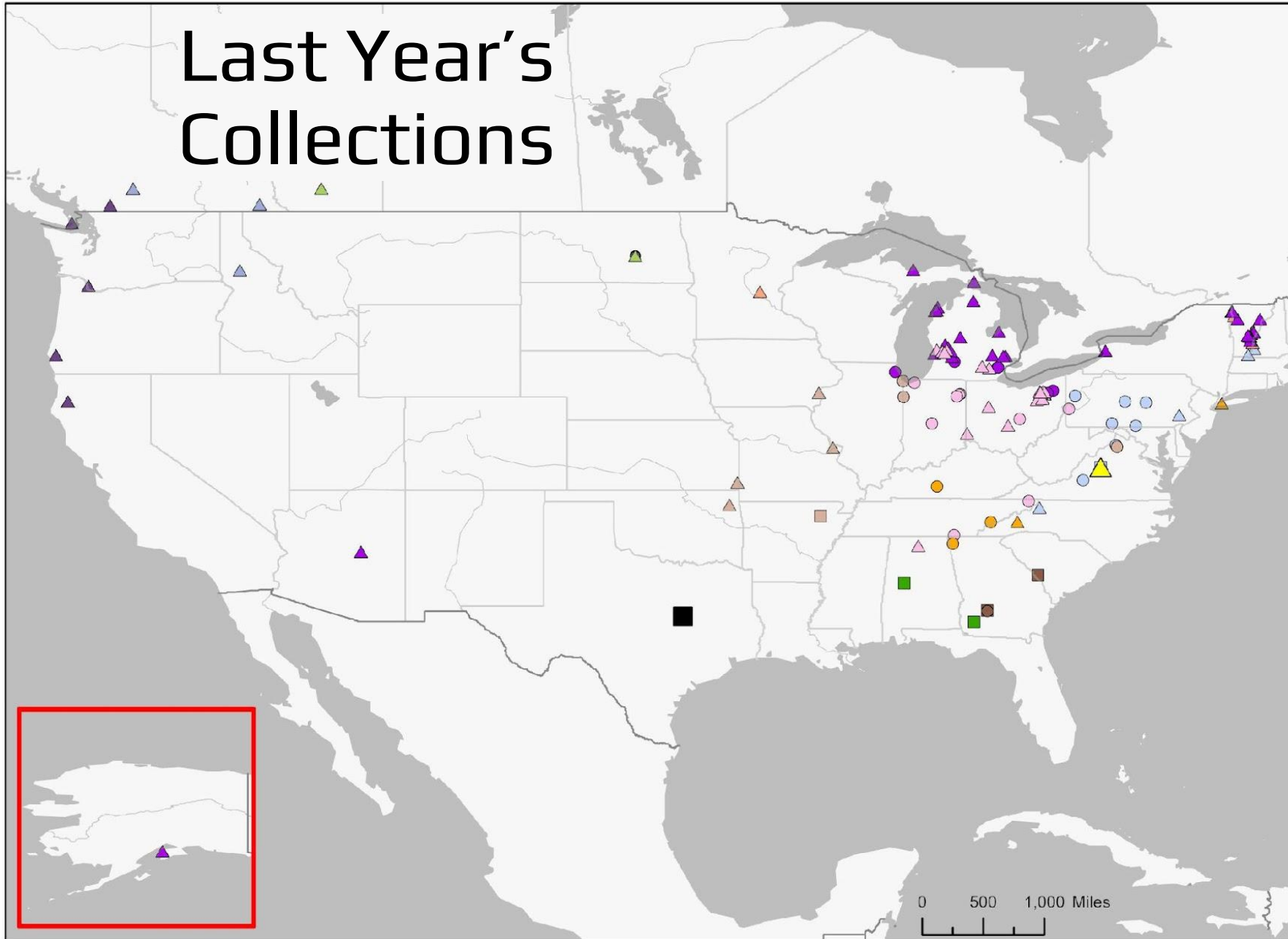


*Eubbranchipus* nsp. 1 from Texas



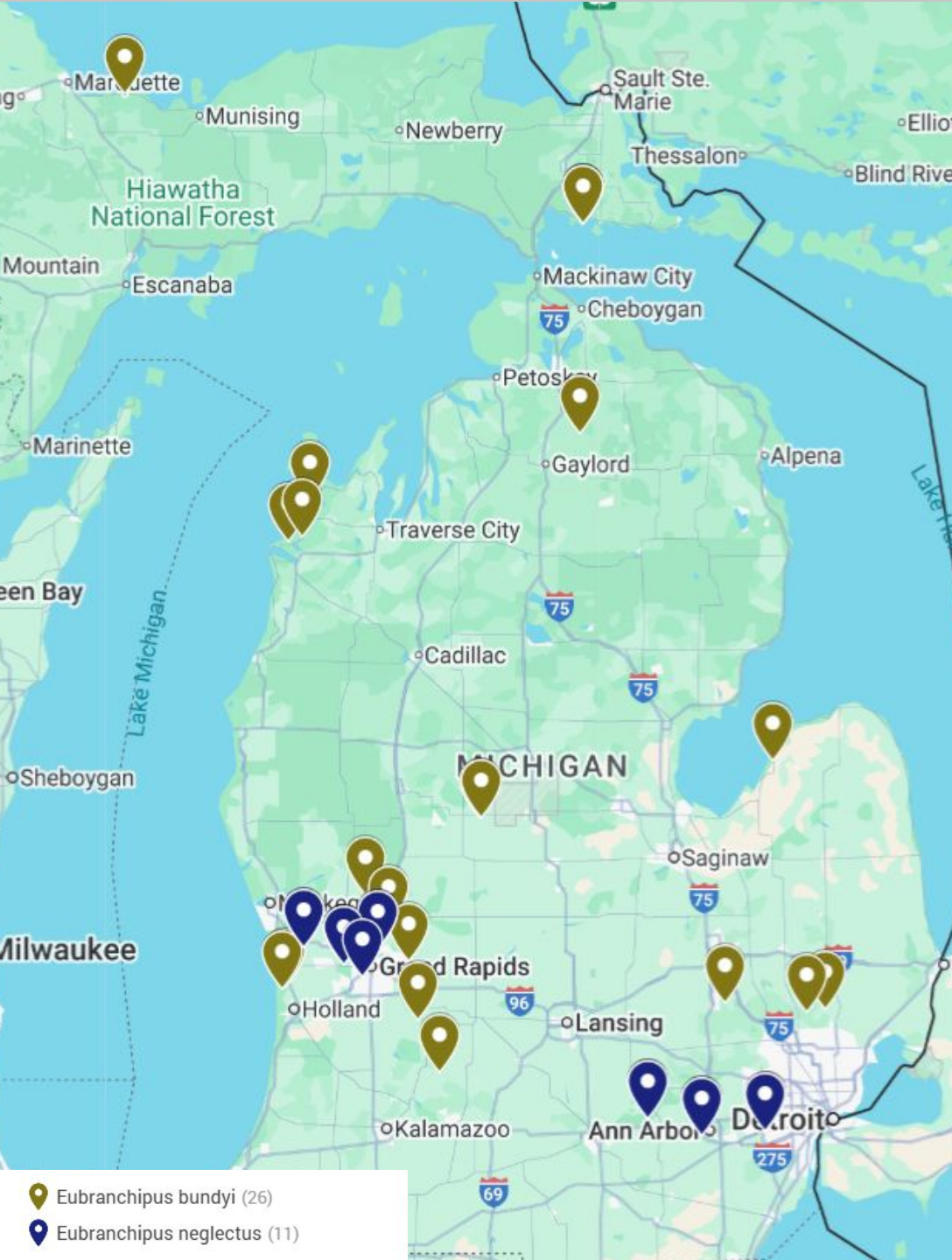
*Eubbranchipus* nsp. 2 from Virginia

# Last Year's Collections



## Legend

- Eubranchipus neglectus* (48)
- Eubranchipus bundyi* (46)
- Eubranchipus vernalis* (15)
- Eubranchipus serratus* (10)
- Eubranchipus intricatus* (8)
- Eubranchipus oregonus* (6)
- Eubranchipus holmani* (5)
- Eubranchipus hesperius* (3)
- Eubranchipus stegosus* (3)
- Eubranchipus moorei* (2)
- Eubranchipus ornatus* (2)
- Eubranchipus nsp1* (1)
- Eubranchipus nsp2* (1)
- Collected by Volunteer (111)
- Collected by Author (35)
- Cultured in Lab (7)



# Last Year in Michigan

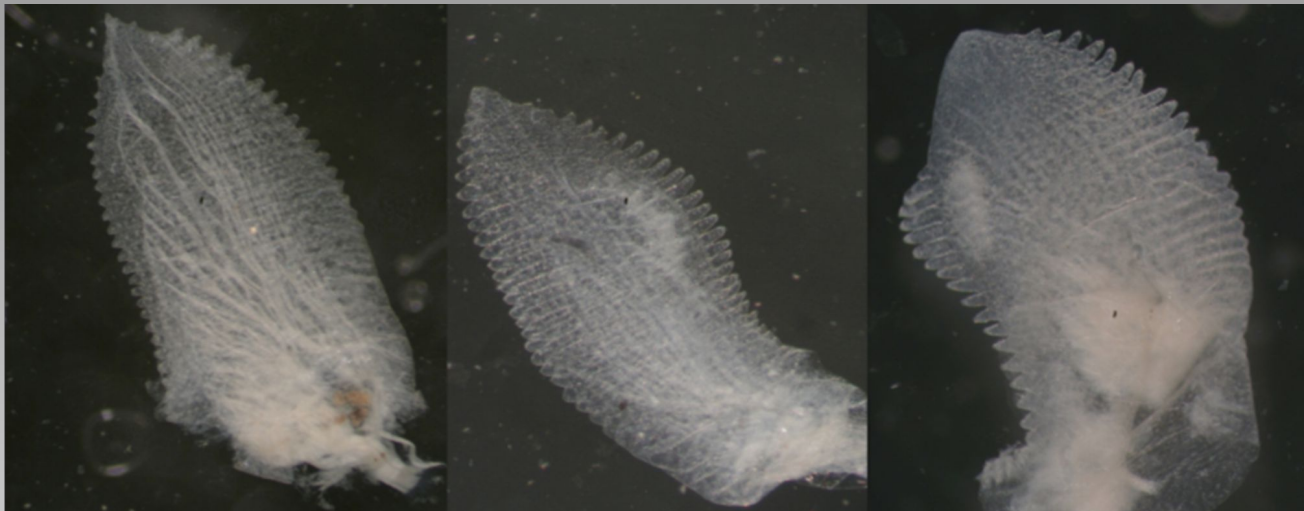
- Michigan had the most collections of any state (37)
  - Ohio and Vermont came in 2<sup>nd</sup> and 3<sup>rd</sup>
- Two species
  - *E. bundyi* (26)
  - *E. neglectus* (11)
- Three instances of co-occurrence
- Seventeen counties



Michigan  
Vernal Pools  
Partnership

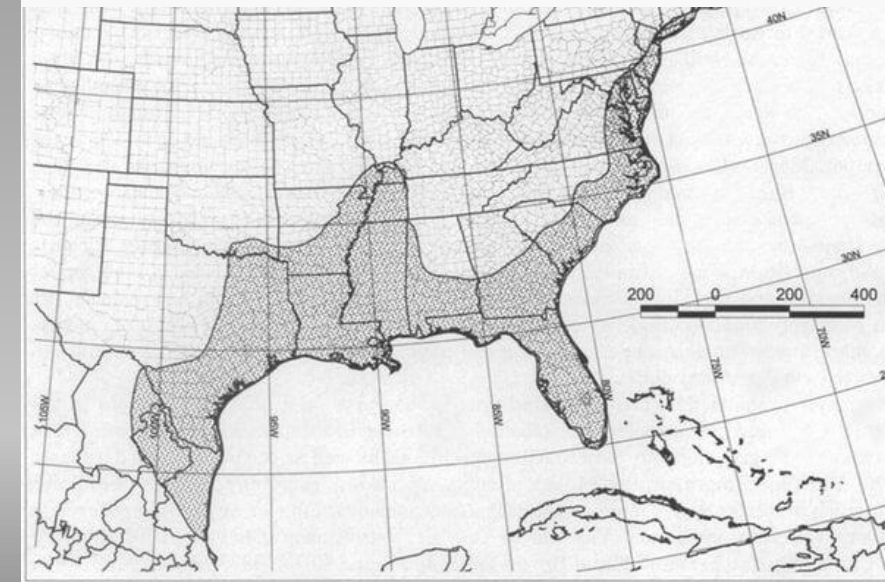
# Hybrids

- Several species groups have potential
- Possible *E. neglectus* and *E. vernalis* hybrids have been found
- COI data confirmed *E. neglectus* maternal lineage
- Nuclear data required for further investigation



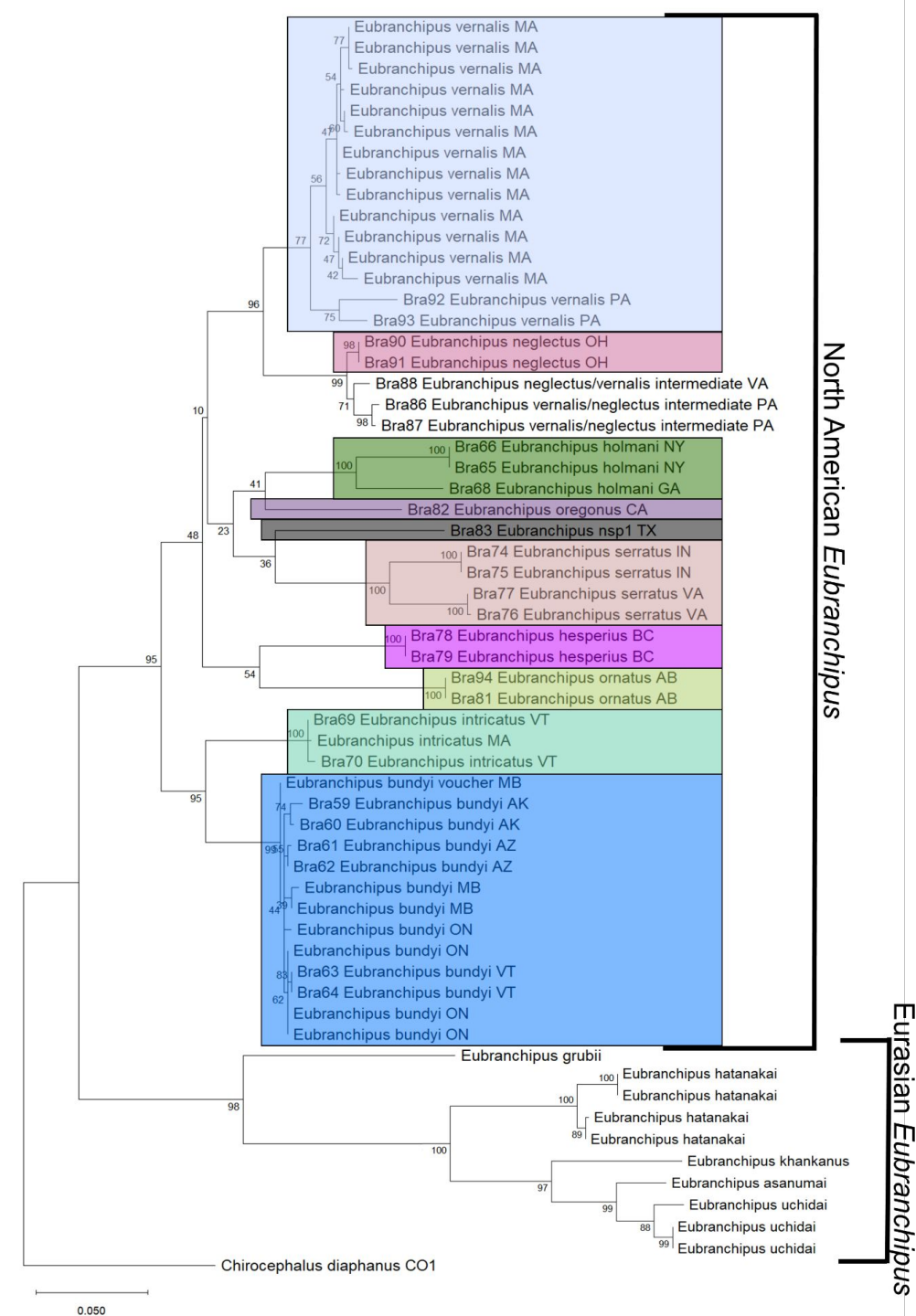
Evidence of potential hybridization (middle) between *E. vernalis* (left) and *E. neglectus* (right)

## NORTH AMERICAN COSTAL PLAIN

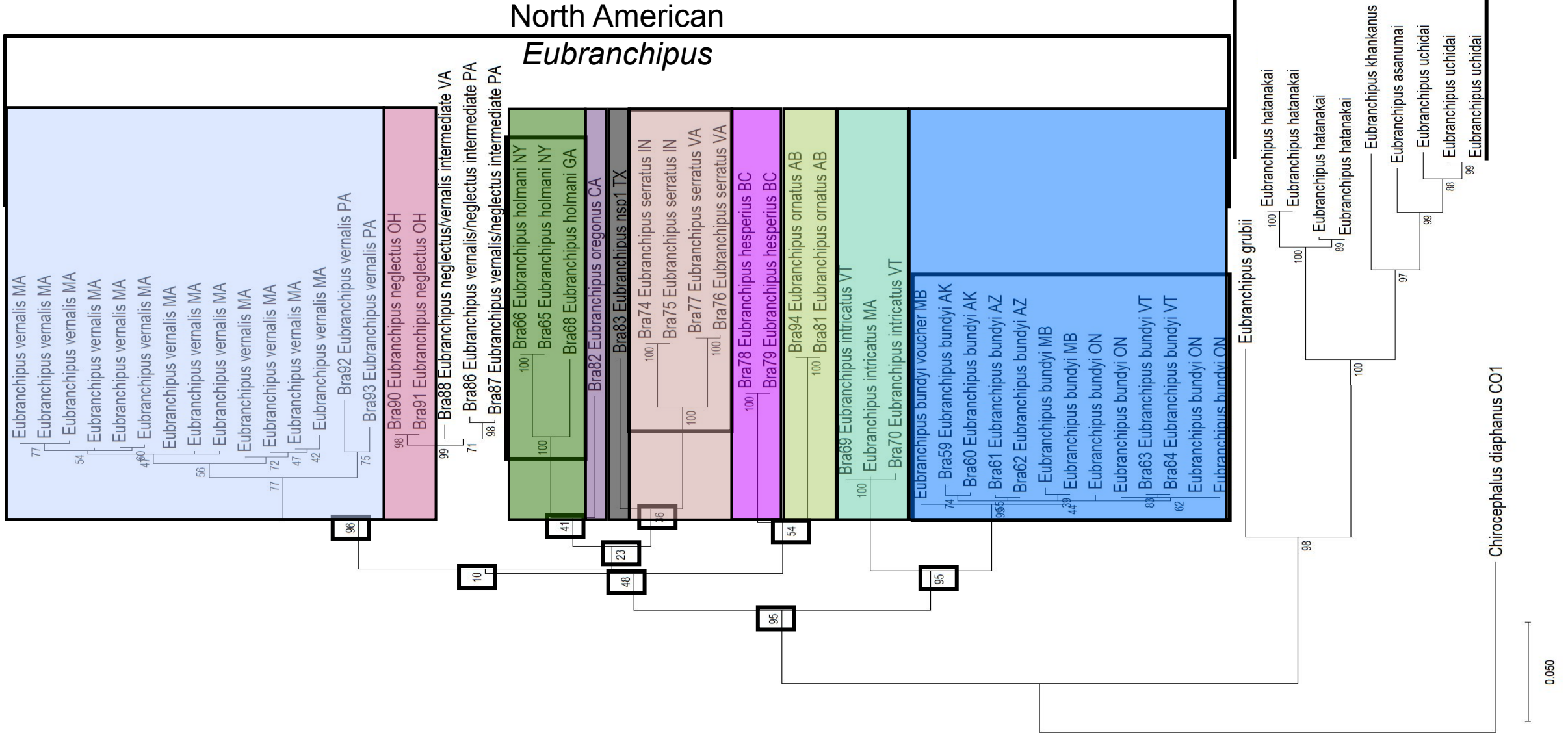


# Preliminary Phylogeny

- CO1 fragment (~600 BP)
- Used Maximum Likelihood (ML) methods
- 500 bootstrap replicates (internal nodes with low support)
- 9/11 described species and 1/2 suspected novel species
- Supplementary Genbank sequences
  - Three North American species
  - Eurasian species
  - Outgroup (*Chirocephalus diaphanus*)

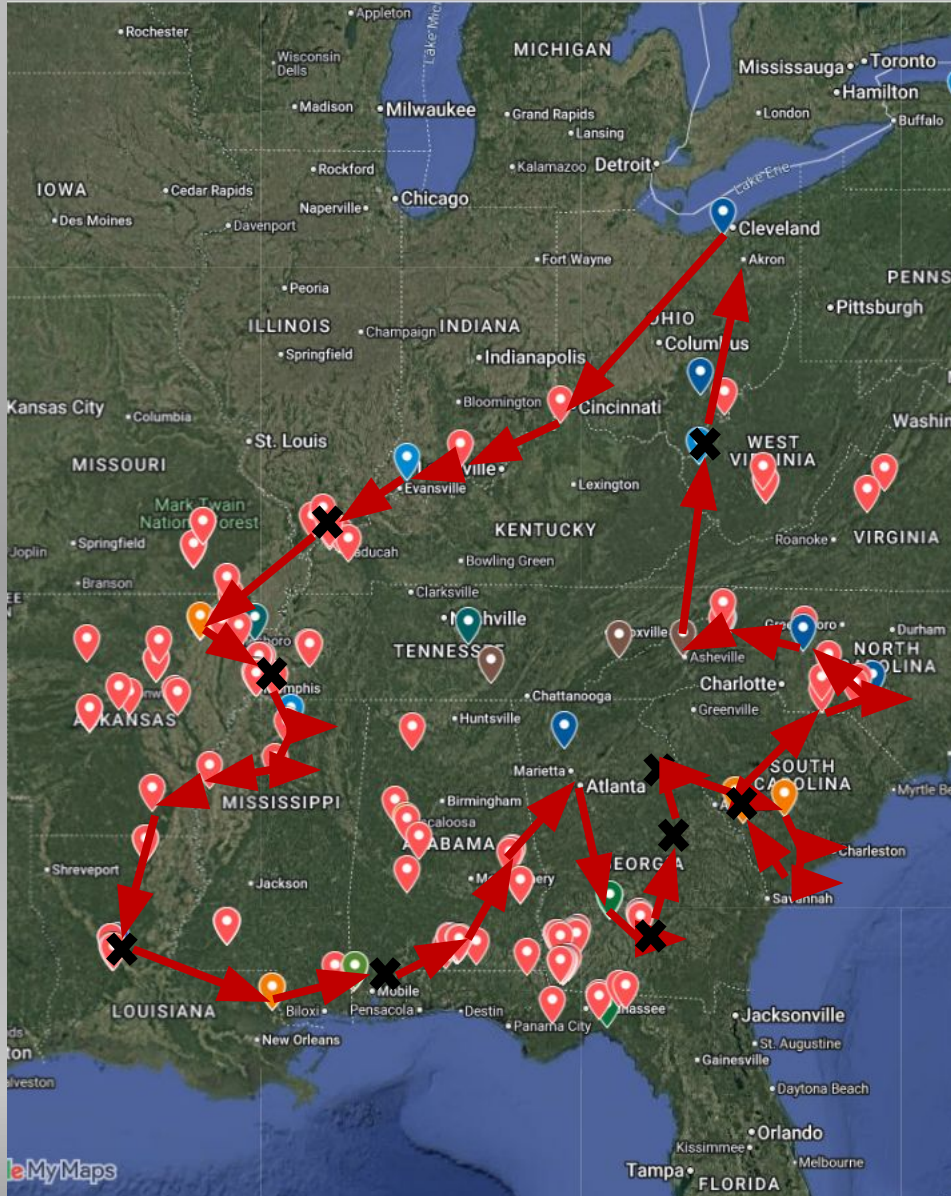


# Eurasian *Eubbranchipus*



***E. bundyi* (MB/ON):** Species diversity and phylogeographical affinities of the Branchiopoda (Crustacea) of Churchill, Manitoba, Canada; Jeffery, N.W., Elias-Gutierrez, M. and Adamowicz, S.J.  
**Eurasian *Eubbranchipus*:** Integrating mitochondrial and nuclear genomic data to decipher the evolutionary history of *Eubbranchipus* species in Japan; Takashi Kitano a, Mitsutoshi Tabata a, Norihito Takahashi b, Kei Hirasawa c, Seiki Igarashi d, Yushi Hatanaka e, Akira Ooyagi f, Keiji Igarashi g, Kazuo Umetsu h  
***E. Vernalis* & *E. intricatus* (MA):** Genetic divergence and phylogeography among Massachusetts populations of the vernal pool fairy shrimp *Eubbranchipus vernalis* (Crustacea: Anostraca); McCafferty, S.S., Warren, N. and Wilbur, C.

# 2026 Southeastern US Collection Trip



- 132 ephemeral waterbodies visited
- 68 had any water
- 60 had a vernal pool facultative species present (*Crangonyx*, *Caecidotea*, *Daphnia*, *Notophthalmus*, or *Lithobates*)
- 42 had a vernal pool obligate species (*Ambystoma*, *Pseudacris*, *Streptocephalus*, or *Eubranchipus*)
- 10 (from 7 sites) had *Eubranchipus*

# This Year so Far

- ~20 collections of six species from across 11 states
- 28 soil collections for lab culturing
- Seven states organizing statewide collection efforts (DNR/Natural Heritage Programs)
- One suspected novel species found (Mississippi)
- State records found for *E. neglectus* (MS?/NC), *E. moorei* (TN/MS)
- Morphological data collected for 50 specimens so far



*E. neglectus*



Suspected MS novel species



# Future Directions

- More collections
- Formal distribution maps
- Species descriptions
- Further genetic work
  - More genes
  - More specimens
  - More populations
- Investigate potential hybrids



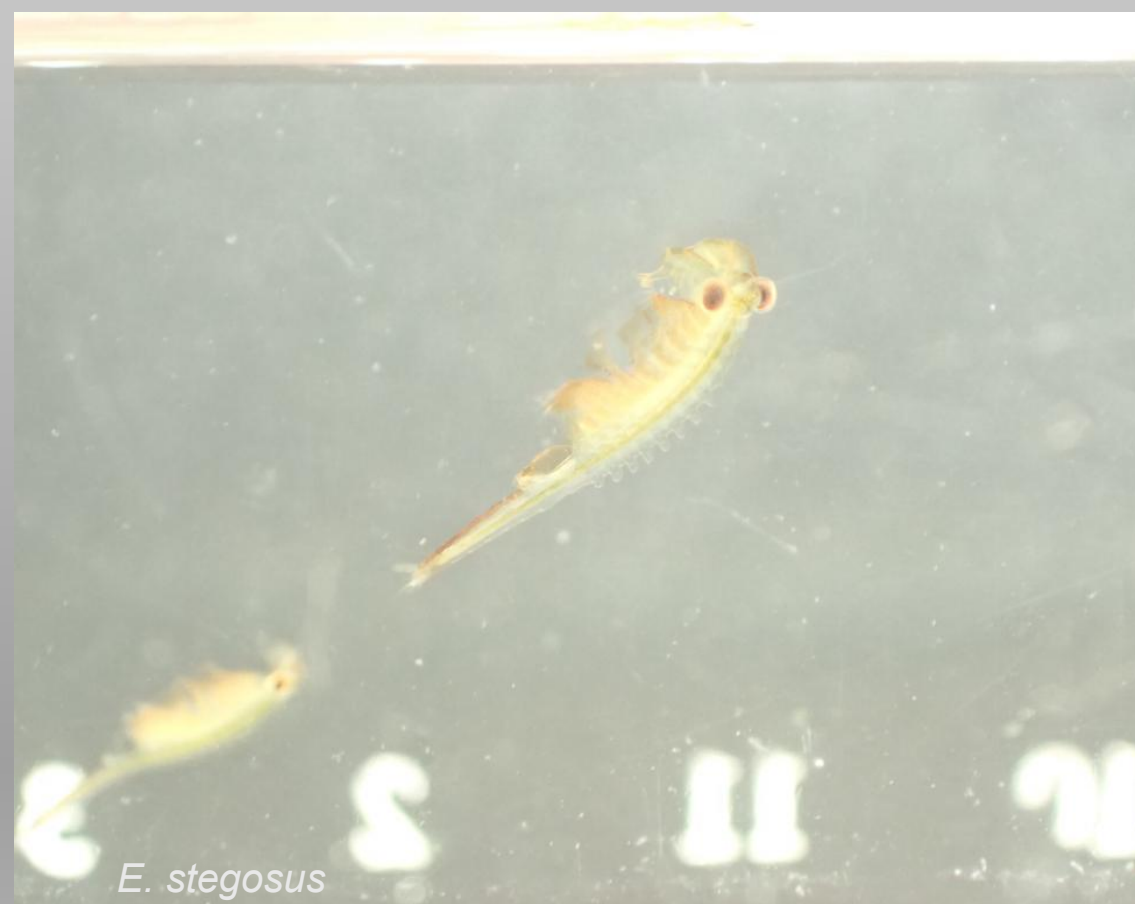
*E. moorei*



*E. moorei*

# Future Future Directions

- Statewide survey in Ohio?
- Statewide surveys in multiple states?
- Region wide surveys?
- Explore hatching criteria
- Exploring niche dynamics between species
  - Hydroperiod of pools
  - Temperature regime of pools
  - Water quality parameters of pools
- **Discover more new species!**



# Thank

You!

Vienna Natural History Museum,  
Michigan Vernal Pool Partnership,  
Vermont Center for Eco-Studies,  
Summit Metro Parks, The Jones  
Center at Ichuaway, Steve Weeks,  
Christopher Rogers, Martin  
Schwentner, Irving Pinales, Cody  
Vue, Rowan Calhane, Ashlan  
Hietala, Christopher Poling, Miriam  
Churchin, and countless  
volunteers!



Fish Lice Volunteer Form



*Eubbranchipus* Volunteer Form