

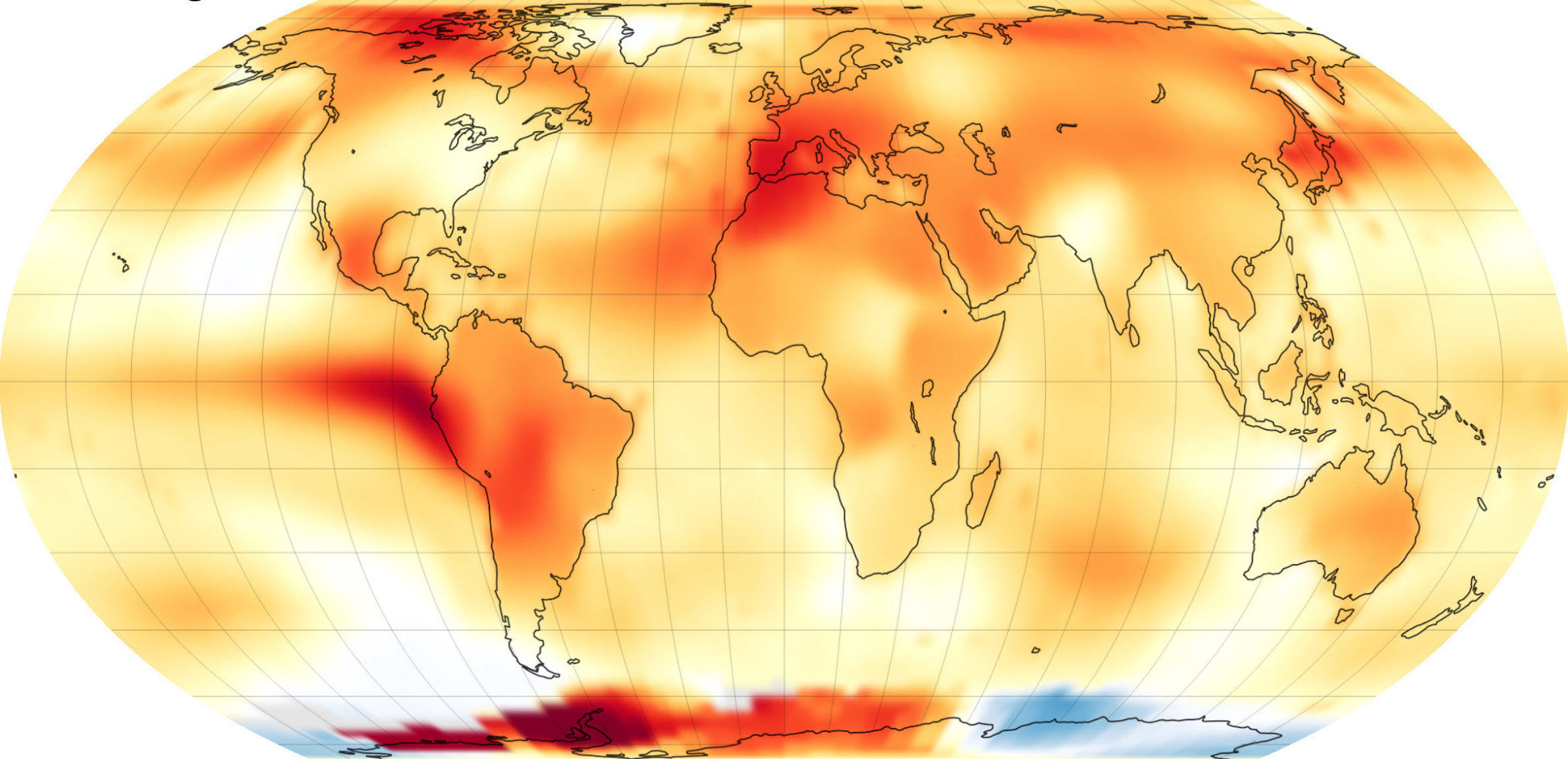
Predatory and parasitic impacts of water mites on mosquito & mosquito borne disease in the urban setting



Adrian A. Vasquez
Mercer University

Georgia Mosquito Control Association Annual Meeting
October 18th, 2023, Villas of the Sea, Jekyll Island

Global Boiling



June, July, and August Global Temperature Anomaly (°C compared to 1951-1980 average)



Source: NASA

What does this mean for mosquito research?

- Warmer climate will lead to insect vectors spreading into new habitats and pose new threats to human health (UN Intergovernmental Panel on Climate Change. Available online: <http://www.ipcc.ch/report/sr15/>)
- The Environmental Protection Agency (EPA) and the Centers for Disease Control (CDC) recommend an Integrated Pest Management (IPM) approach for the control of mosquitoes (<https://www.epa.gov/mosquitocontrol/joint-statement-mosquito-control-united-states>)



Review

The Biodiversity of Water Mites That Prey on and Parasitize Mosquitoes

Adrian A. Vasquez ^{1,2,*}, Bana A. Kabalan ³, Jeffrey L. Ram ⁴ and Carol J. Miller ¹

Integrated pest management control

- Ecosystem based strategy using a combination of approaches such as biological control, habitat manipulation and pesticides (after monitoring indicates they are necessary to remove the target).
- Uses common-sense practices like current, comprehensive information on life cycles of pests and their interaction with the environment (ecosystem services)
- My research has been looking at water mites and their roles as predators and parasites of mosquitoes.

The Ecology and Physiology of Water Mites

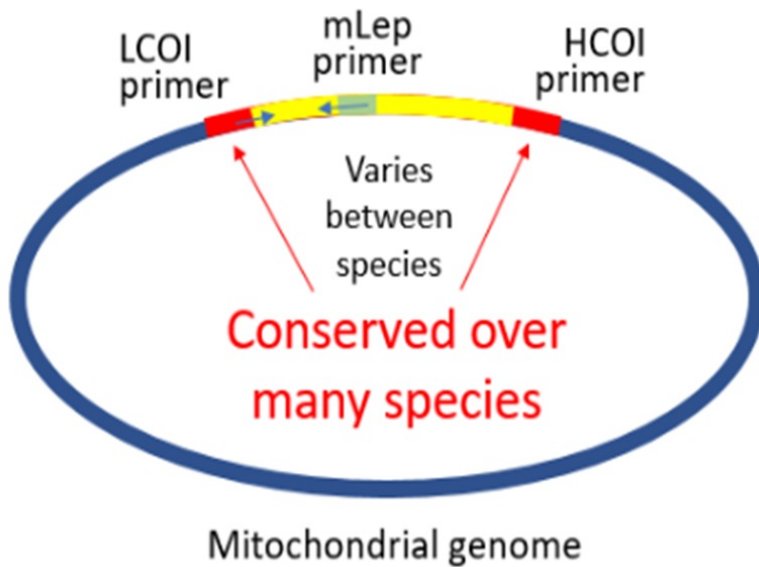
- Water mites are aquatic arachnids that inhabit mostly freshwater habitats and are the most biodiverse arachnid known
- Prior to my work the diet constituents was only known through laboratory observations
- My question is: Are water mites specialist or generalist feeders?



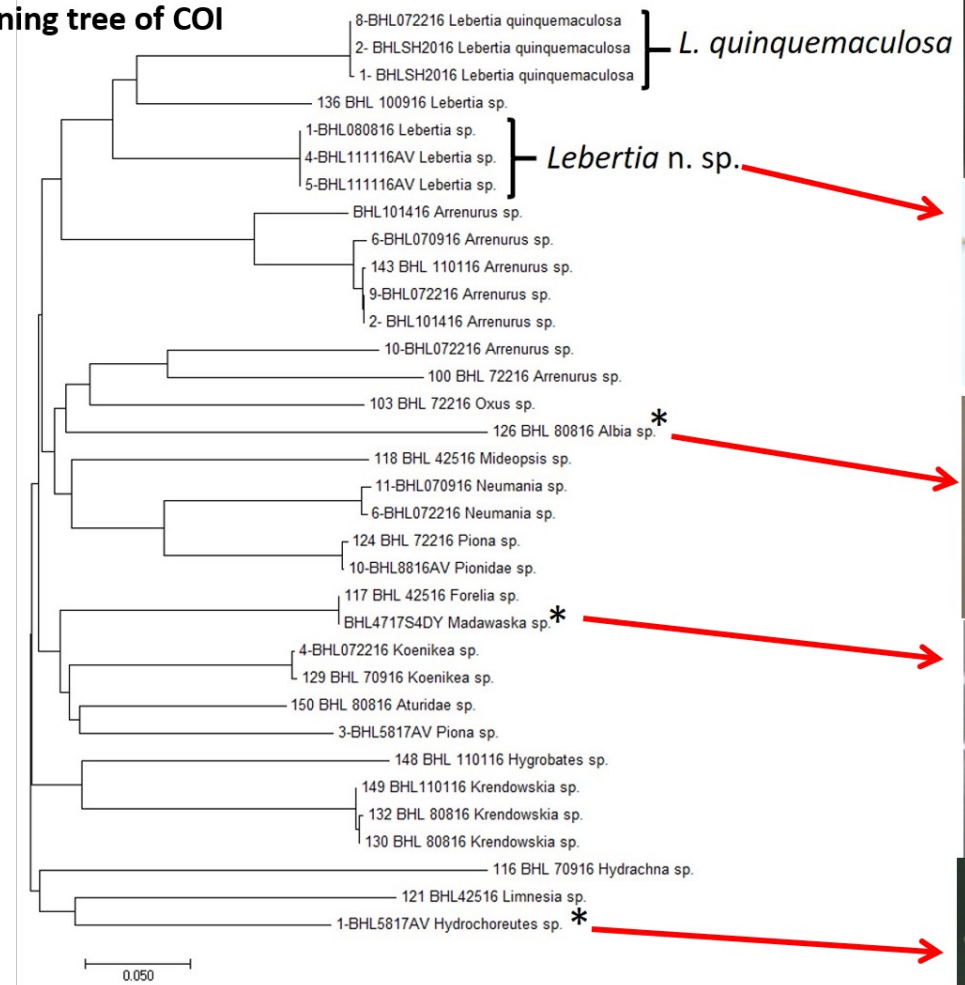
Biodiversity of water mites



DNA barcoding



Neighbor-joining tree of COI sequences



Vasquez et al. 2020. Water mite assemblages reveal diverse genera, novel DNA barcodes and transitional periods of intermediate disturbance.

What are Water Mites?

Biodiversity

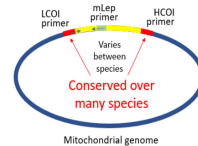


Vasquez et al. 2020. Water mite assemblages reveal diverse genera, novel DNA barcodes and transitional periods of intermediate disturbance.

Feeding experiments and molecular studies of diet constituents led to strange observations!



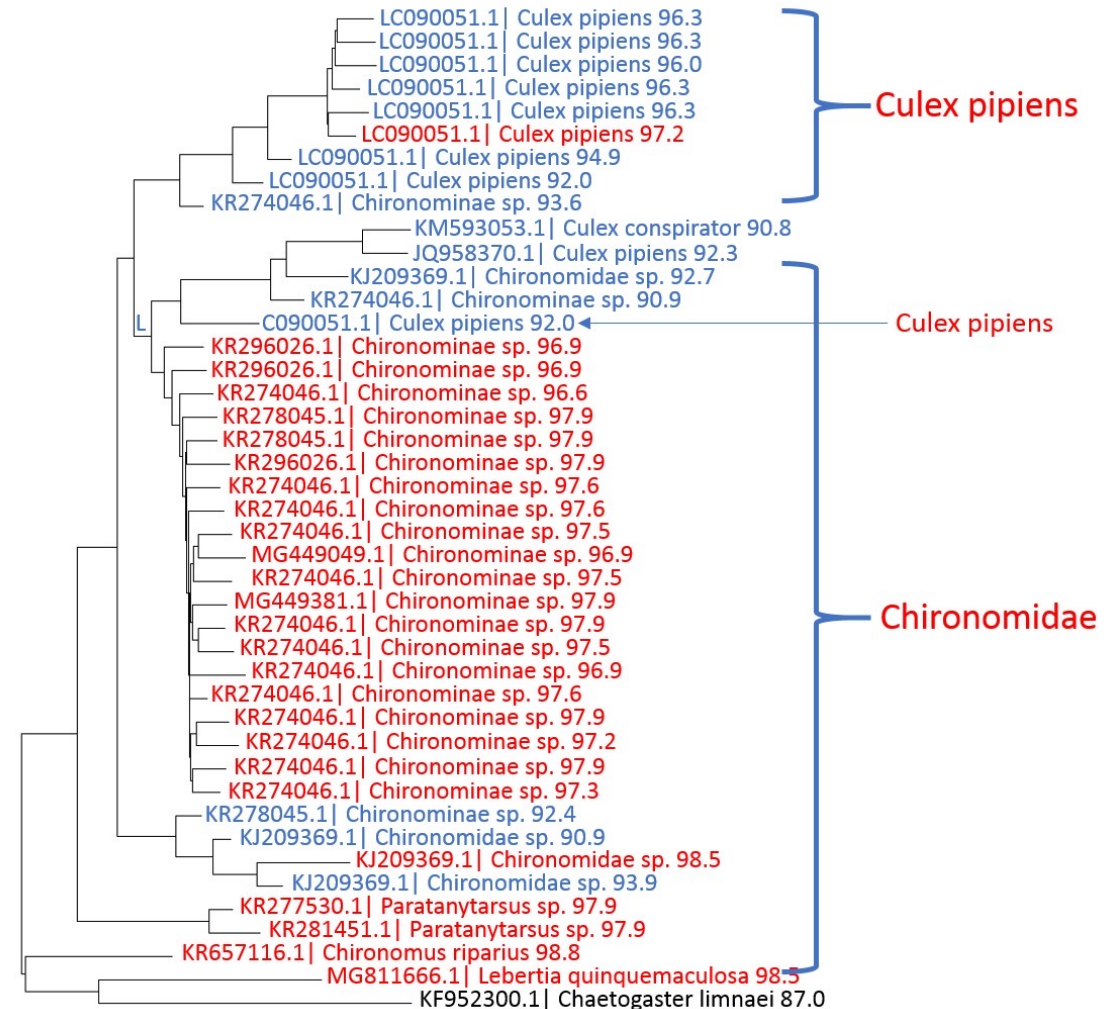
Molecular diet composition revealed by Next Generation Sequencing of water mite gut contents



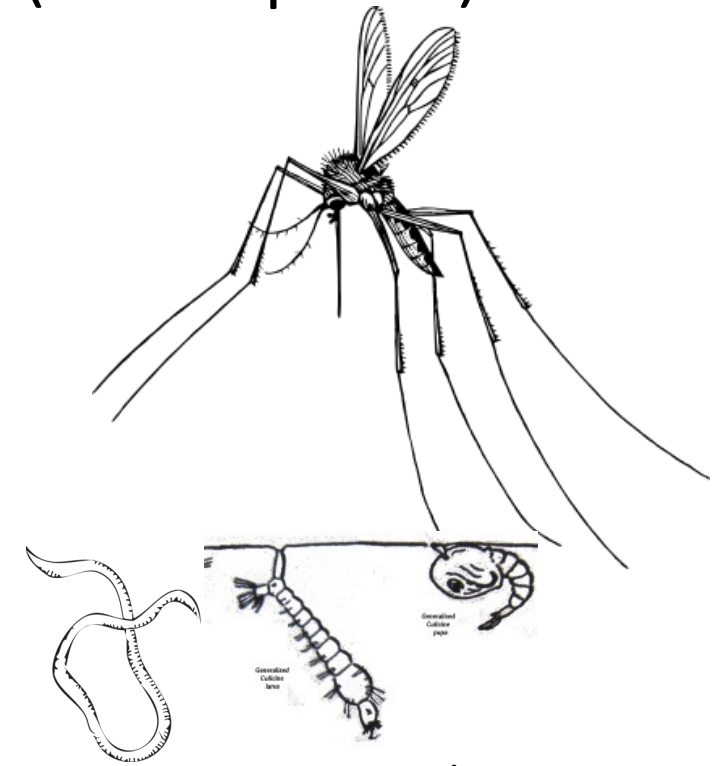
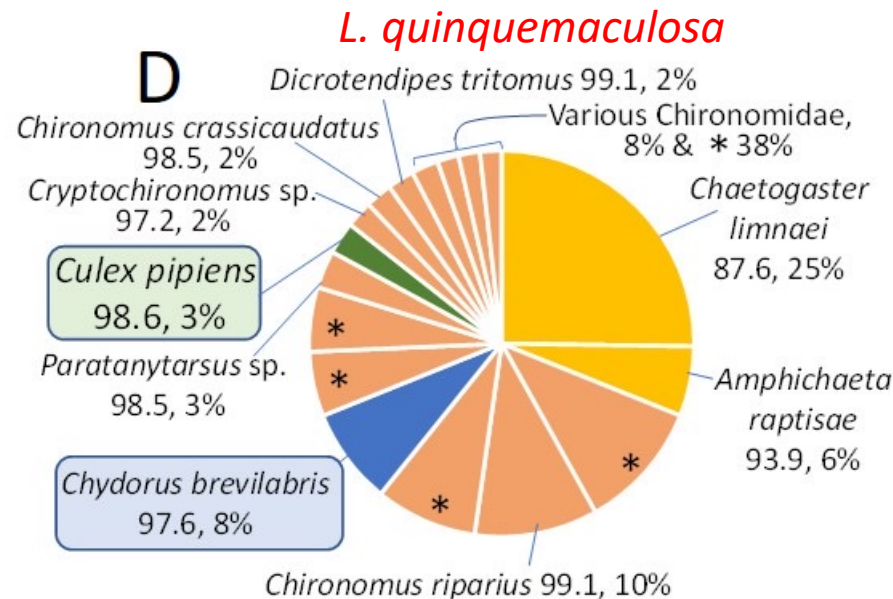
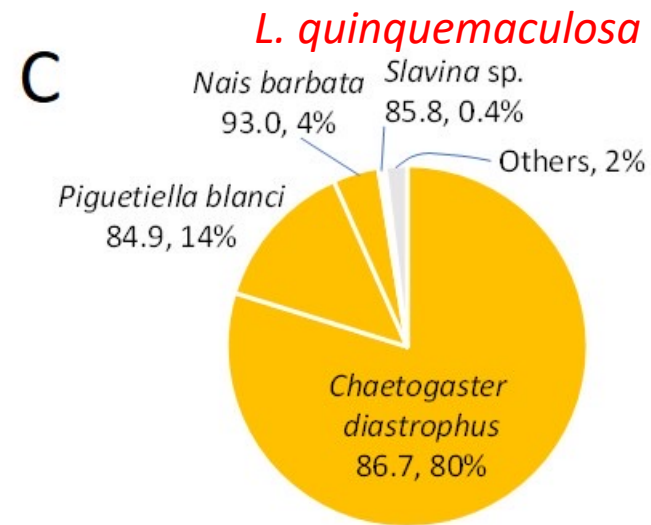
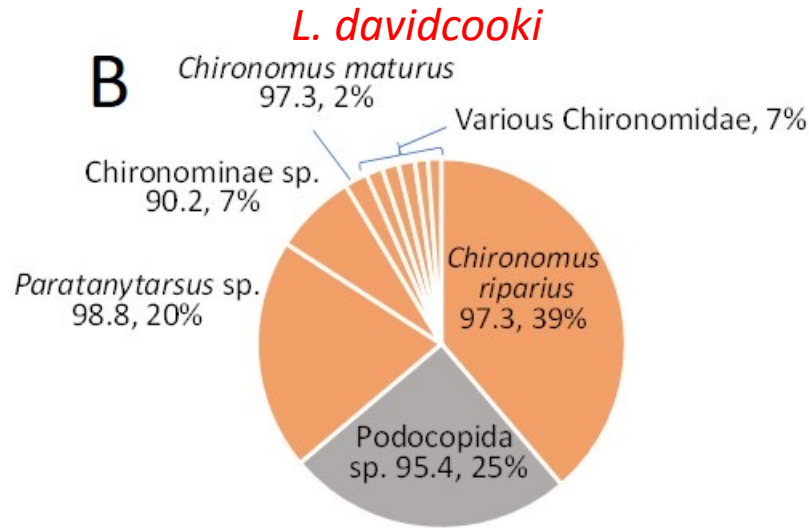
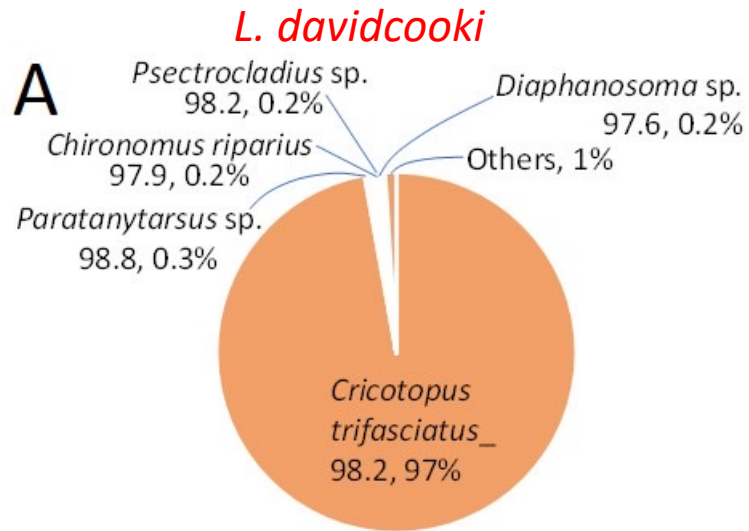
Next generation Sequencing



Bioinformatics



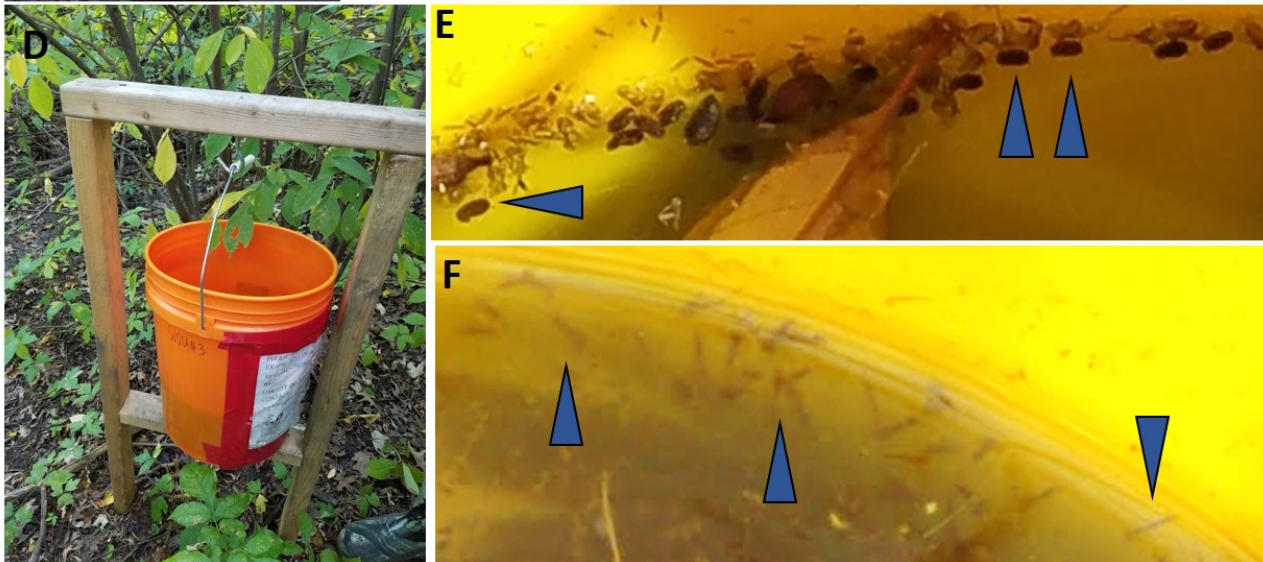
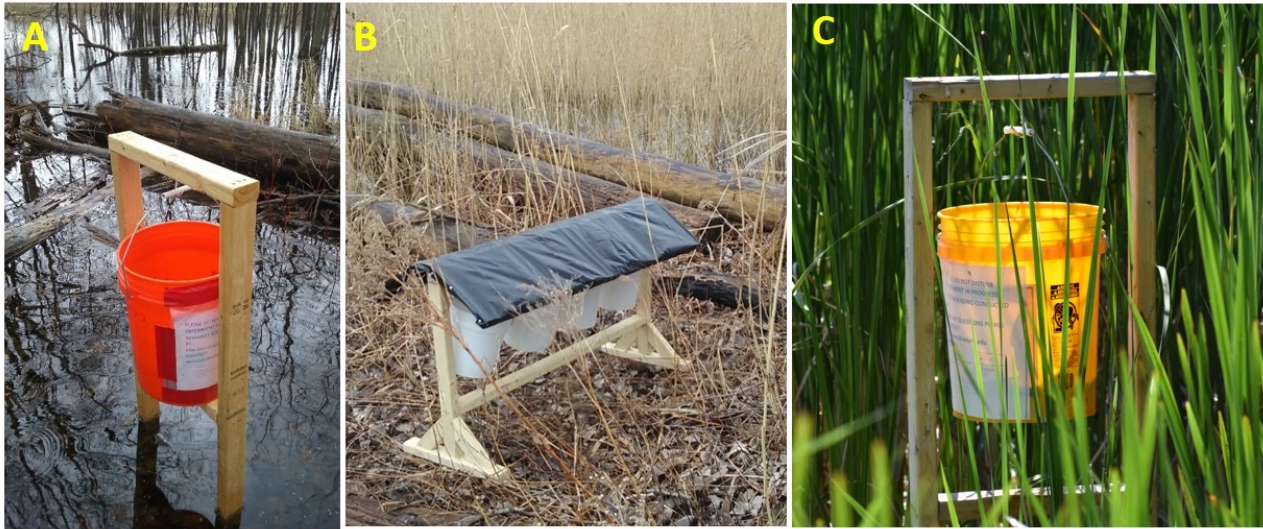
Water mites are feeding on *Culex pipiens* (mosquito) and Oligochaetes (aquatic worms) !!



Legend:

1. Orange: Chironomids (midges)
2. Yellow: Worms (oligochaetes)
3. Blue: Water fleas
4. Green: Mosquitoes
5. Grey: Ostracods (crustaceans)

One Health includes the health of organisms, humans and the environment.



NIH / Research Enhancement
Building Infrastructure Leading to Diversity

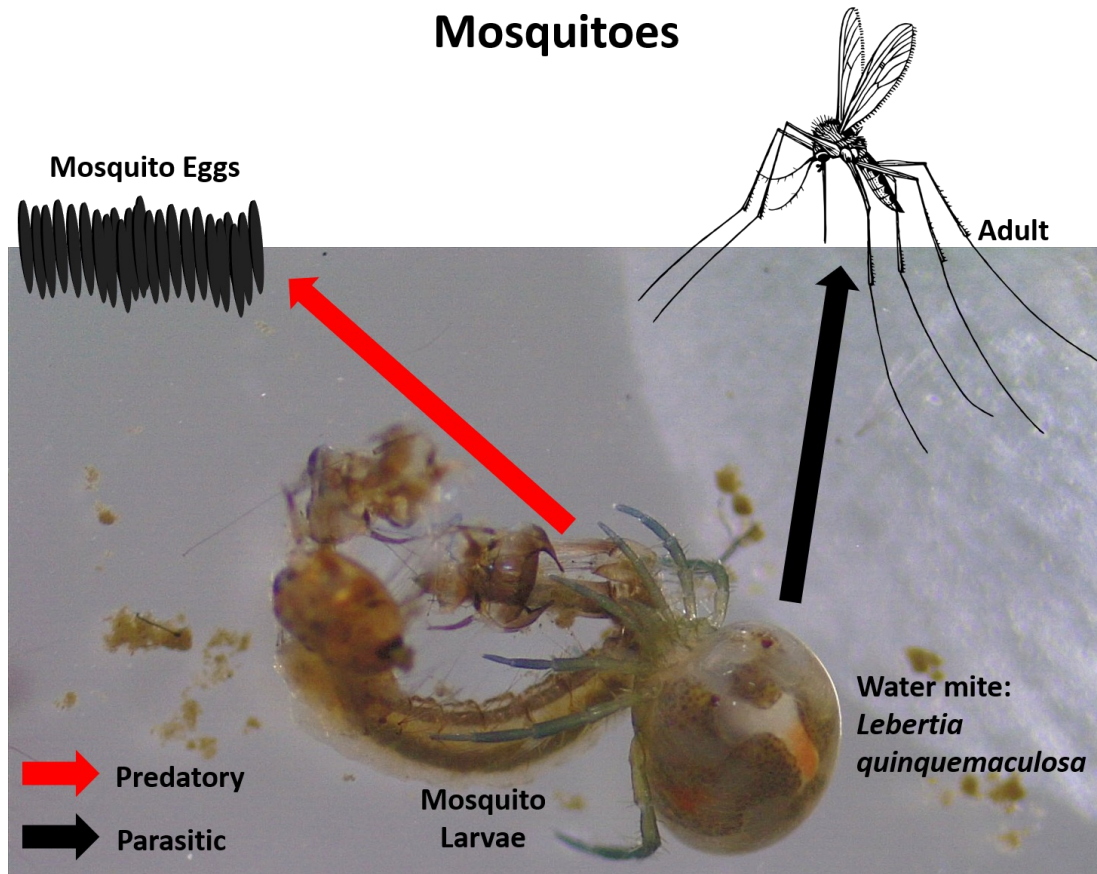
REBUILDDetroit

University of Detroit Mercy
Wayne State University



How does biodiversity affect Vector Biology and Public Health?

Diverse Biotic Interactions of Water Mites and Mosquitoes



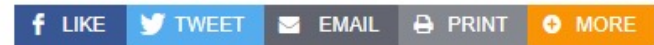
Vasquez et al. 2020. The Biodiversity of Water Mites That Prey on and Parasitize Mosquitoes



Hot Topics: [Law](#) [Art](#)

Mighty mites might manage mosquitoes

By Weiting Du | July 15, 2020



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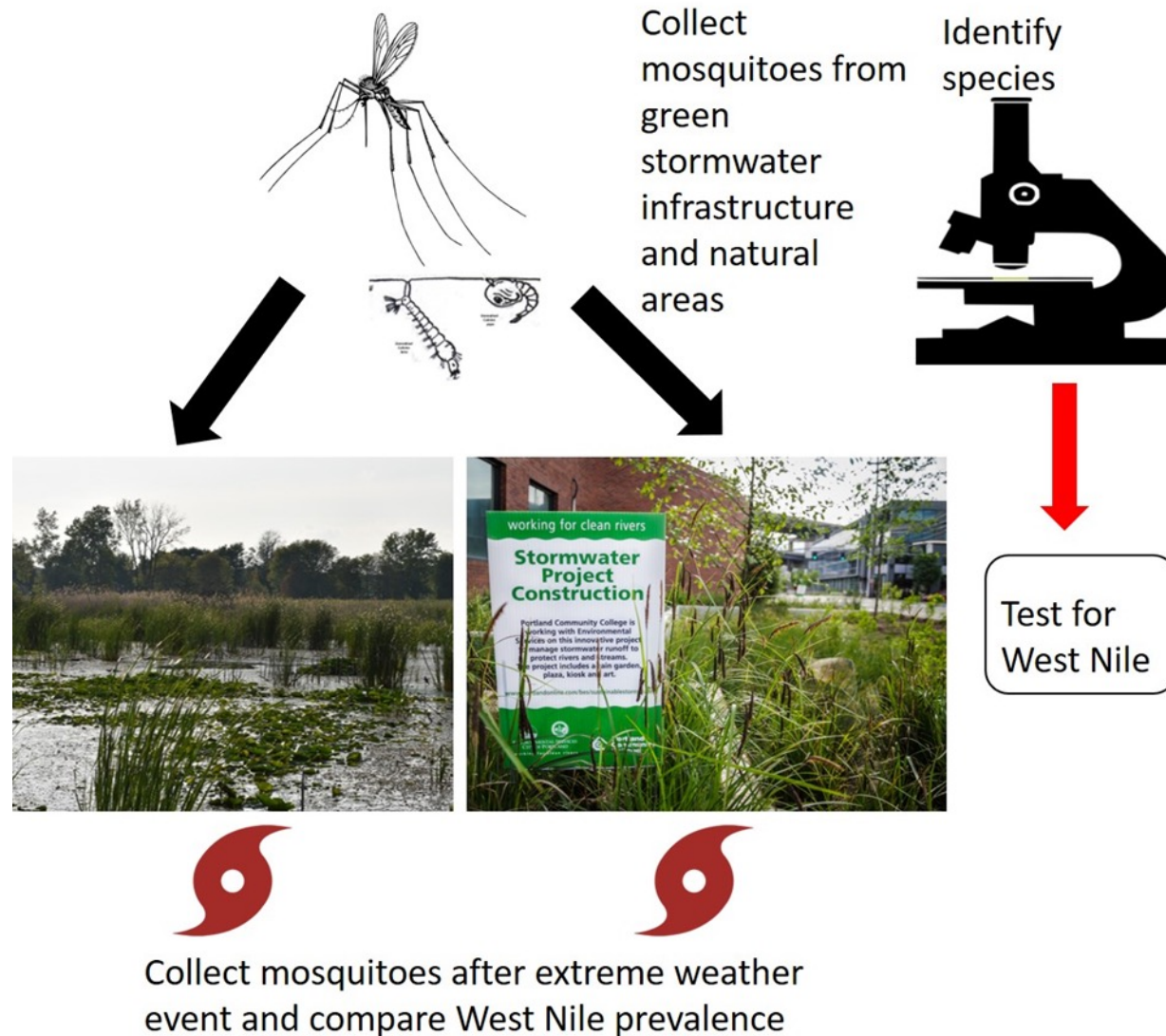
Adrian Vasquez and a young scientist monitoring the mesocosm "buckets" in Lake St Clair Metropark, Harrison Township, Michigan. Image: Alma Cruz

By Weiting Du

Other water mite genera are also mosquito larvae predators



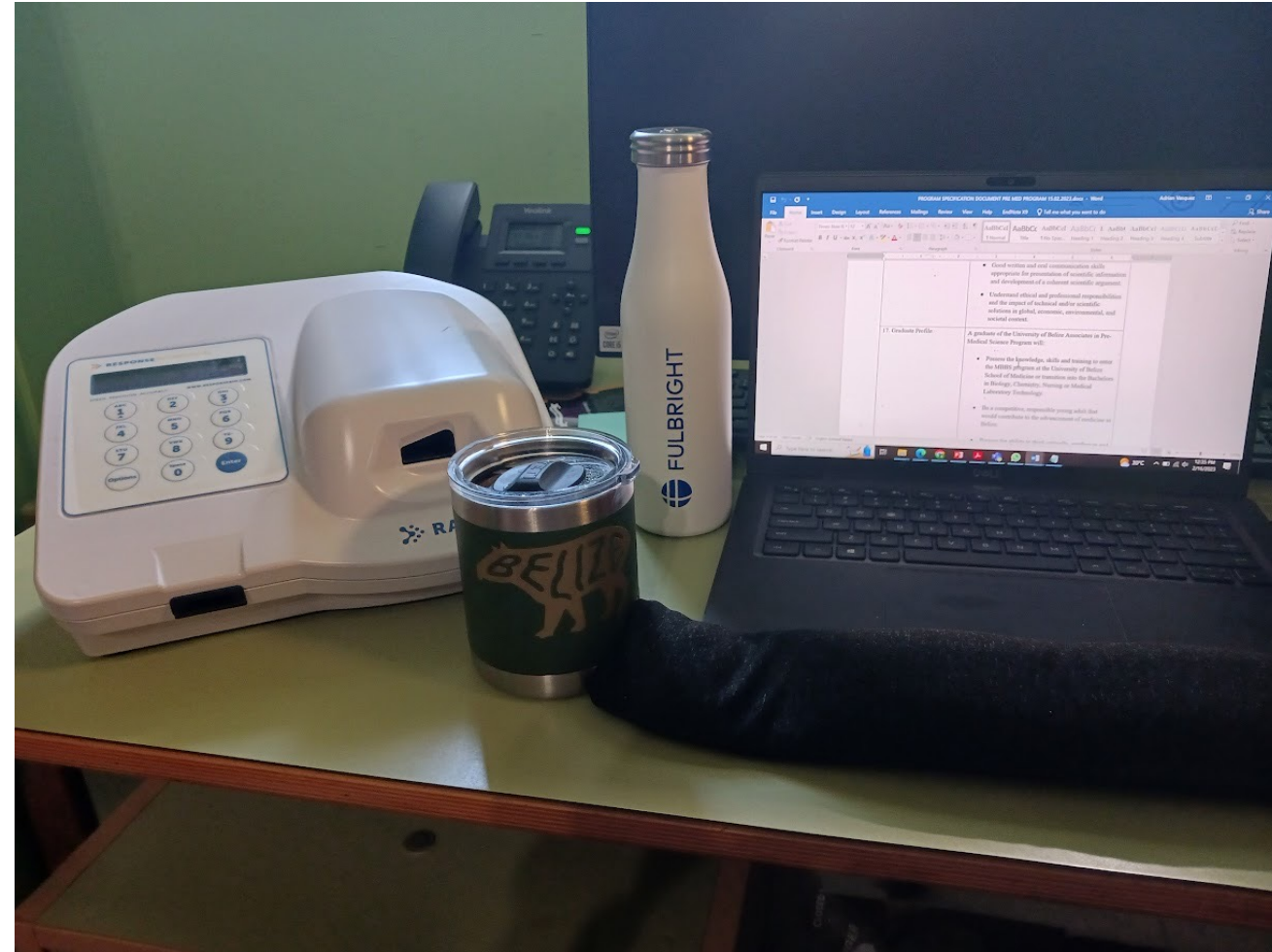
Current Research in the Vasquez Lab



Trapping mosquitoes



- Use of the portable RAMP instrument to measure West Nile Virus in Mosquitoes of Belize, Detroit and Georgia

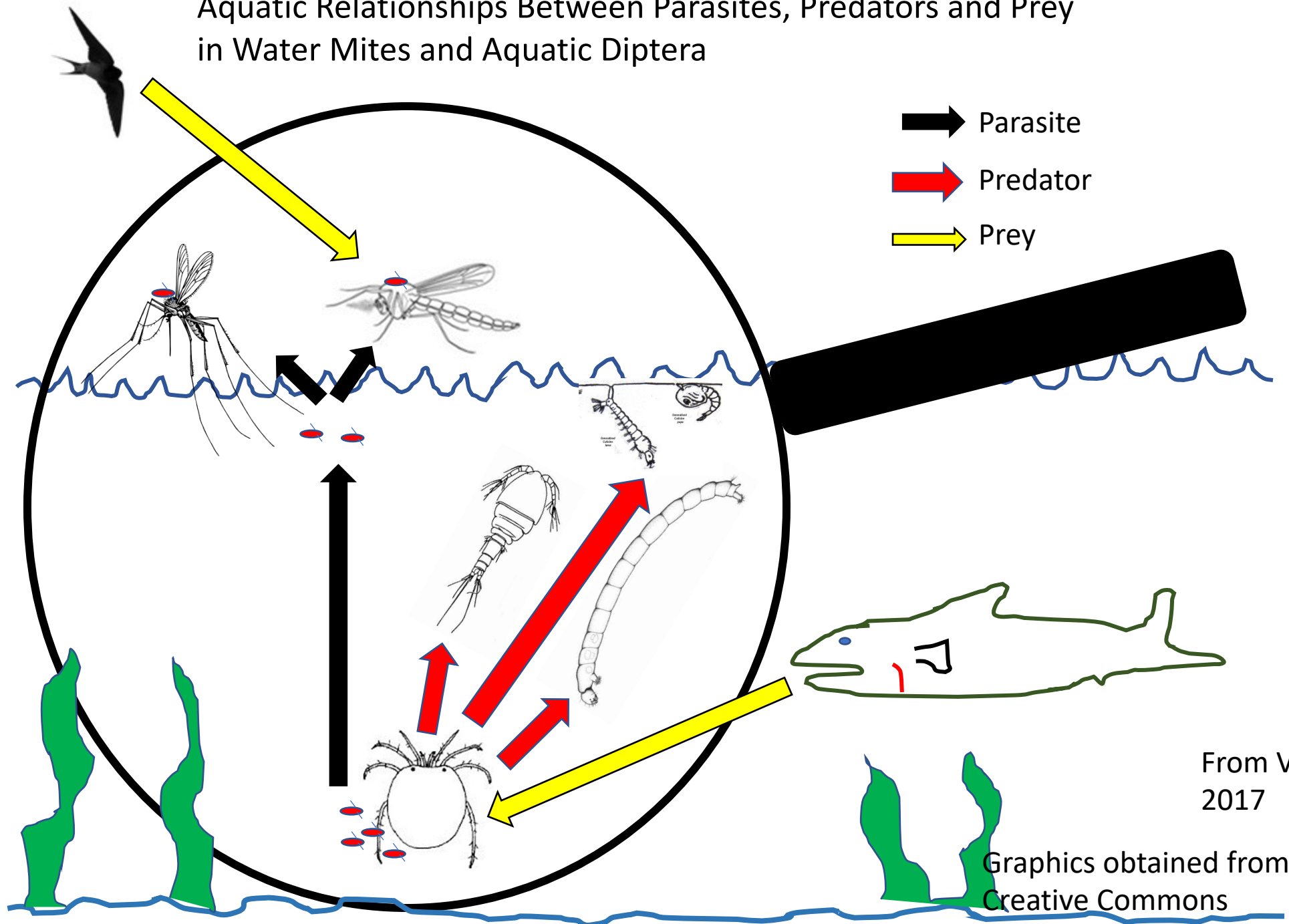


Catching vectors: Field Trips



Water Mites

Aquatic Relationships Between Parasites, Predators and Prey in Water Mites and Aquatic Diptera



From Vasquez et al
2017

Graphics obtained from
Creative Commons



The work continues.....

Contact me @: vasquez_aa@mercer.edu

- Thanks to my funders and to many mentors and students!
- Questions?



The Sittée River



University of Belize

