

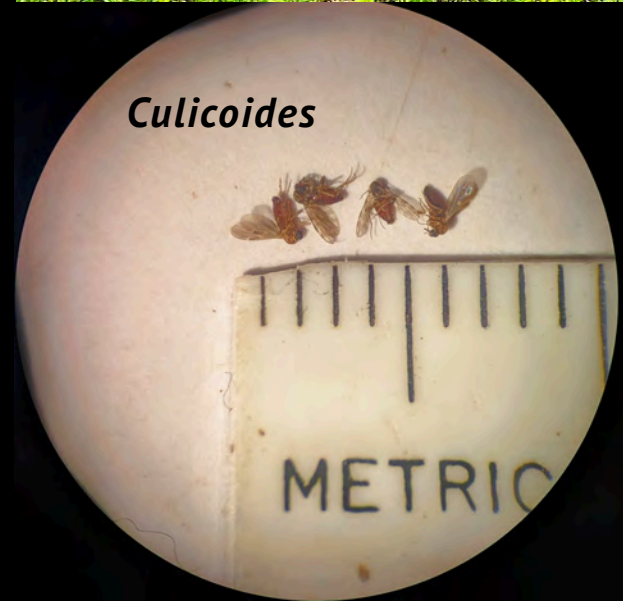


# BITING NEWS

## UPDATE ON BITING MIDGE RESEARCH

**Stephanie Zapata**

There have been reports of outbreaks of bluetongue virus in sheep and epizootic hemorrhagic disease virus in white tailed deer in New Jersey. However, the two main WHO recognized vectors, which are species of biting midges (*Culicoides*), are not known to be present. Because knowledge of the current species distribution of biting midges in New Jersey is unclear we conducted a broad surveillance project throughout the state during the summer of 2023. Then, we developed a meta-barcoding analysis with both single and pooled midges collected from diverse habitats to create an updated species list and a broad midge phylogeny inclusive of New Jersey specimens. So far, we think there are a dozen biting midge species in New Jersey, and broad surveillance will continue throughout the state for the next consecutive summers to update the current *Culicoides* species list.



# CVB'S NEWEST ADDITION!



## Hend Abdullah

Dr. Hend Abdullah joined the Center for Vector Biology as a Postdoctoral Associate in July 2023. She is actively involved in multiple research projects, including the population genetics of the newly invasive Asian longhorned tick, which poses a threat to human and animal health. This project is a collaborative effort between the Fonseca lab at Rutgers University and the USDA-ARS, Beltsville, MD. Additionally, Dr. Abdullah contributes to research on vector-borne diseases (VBDs) and their associated vectors.

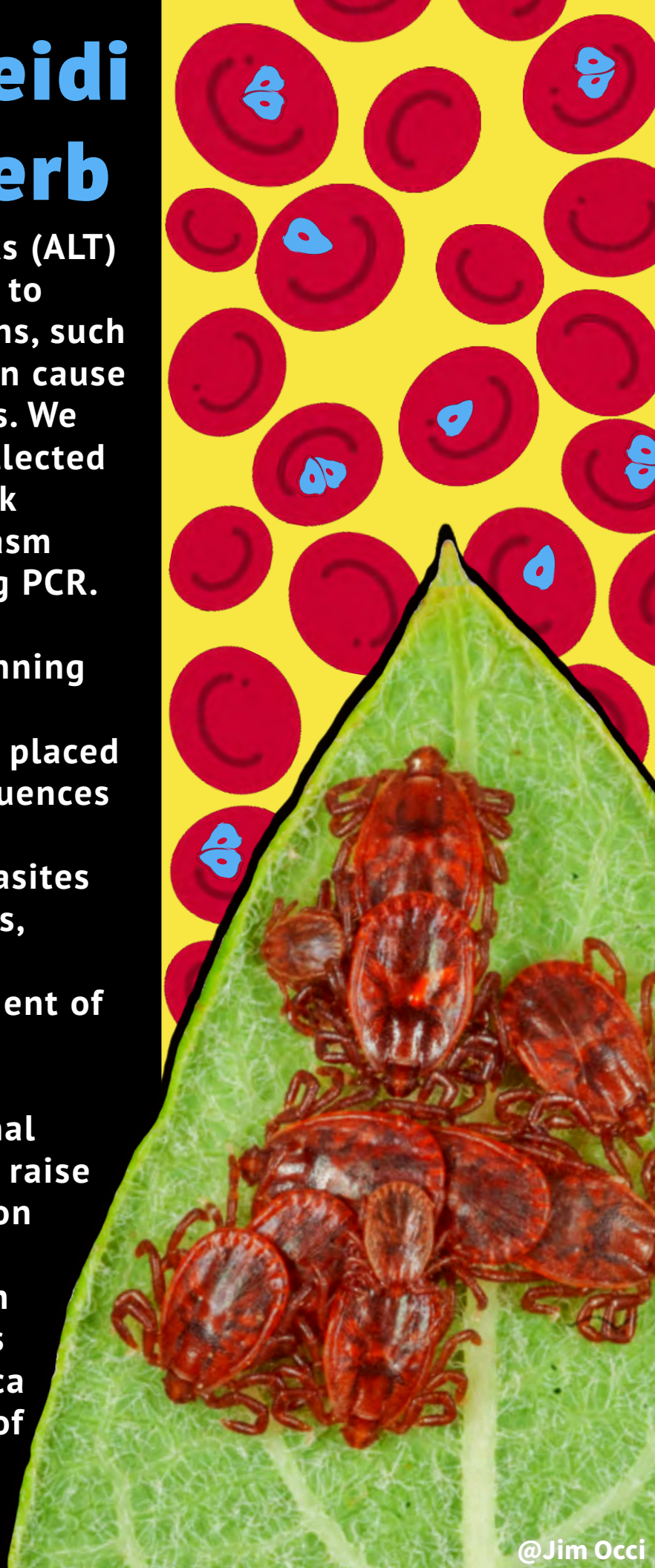
Throughout her tenure, Dr. Abdullah has honed her research skills in the molecular epidemiology of VBDs and the genetic diversity of vector-borne pathogens. Her work has involved extensive fieldwork, sample collection from animal hosts, tick identification, DNA extraction, quantitative and standard PCR, Sanger, and next-generation sequencing techniques, as well as comprehensive experience in bioinformatics and phylogenetic analyses.

Dr. Abdullah's academic journey includes obtaining a bachelor's degree in 2005, a master's degree in 2010, and a Ph.D. in Veterinary Sciences in 2017, all from Cairo University, Egypt. She was a postdoctoral researcher at Institut Hospitalo-Universitaire en Maladies Infectieuses (Infectious Diseases), Marseille, France, in 2018, and is an Assistant Professor at the Veterinary Research Institute National Research Centre, Egypt.

Dr. Abdullah has actively contributed to the academic community by serving as a member of Ph.D. advisory committees where she mentors students in their research journey, aids in data analysis, and reviews dissertations. Dr. Abdullah has 20 published articles and 272 citations of her research.

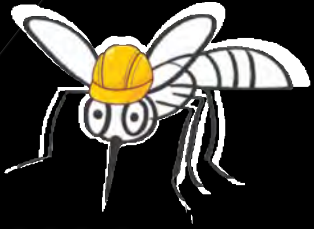
# TICKS IN | Heidi ONE HEALTH | Herb

Invasive Asian longhorned ticks (ALT) are of One Health concern due to their ability to vector pathogens, such as piroplasm parasites, that can cause disease in humans and animals. We tested several hundred ALT collected in and around the Rutgers Cook campus for evidence of piroplasm parasites at multiple loci using PCR. DNA sequences from a diverse assemblage of piroplasms spanning three clades in the piroplasm phylogeny were recovered and placed in a phylogenetic context. Sequences recovered matched existing sequences from piroplasm parasites known to cause disease in dogs, piroplasm parasites closely associated with the primary agent of human babesiosis and yet undescribed piroplasms. These findings published in the journal *Parasitology* (Herb et al 2023) raise concerns regarding transmission amplification and spillover of pathogens important to human and animal health in this tick's invasive range in North America and highlight the importance of using generalist primers to screen for pathogens.



# NJMCA

**The Many  
Hats of  
Mosquito  
Control**



**111th  
Annual  
Meeting  
March  
20-22,  
2024  
The Golden  
Nugget, AC**

**New Film  
Festival!**



**Matt Bickerton and  
John Necina  
working on the  
barcoding  
project**

# MISSION MOSQUITO

## Matthew Bickerton

The NJMCA R&D Committee is working to barcode all 64 New Jersey mosquito species. The partners are Andrea Egizi & Kyle Cole (Monmouth), Taryn Crepeau (Middlesex), John Necina (Warren), Russ Berger (Morris), Manar Soliman (Hudson), and Kyle Rossner (formerly Cape May).

Searches in BOLD and NCBI revealed that cytochrome oxidase 1 (cox1) sequences are available for many of the mosquito species known from NJ. However, some rare species are missing, several common species are not well-represented (< 5 sequences), and often there are no records specifically from New Jersey. For 14% of species known to occur in New Jersey, the nearest cox1 records are from specimens collected 800 miles away in the southern or western US.

We obtained specimens by collecting directly from field sites in 2023 and requesting county programs to submit hard-to-find species. We currently have specimens from 49 species and are working to track down more.

Our main goal is to develop a barcoding library for New Jersey mosquitoes to aid in identification confirmation. We expect to shed light on which members of several species complexes occur in NJ. Since we are comparing samples from multiple NJ regions, we will also gain insight on intraspecific genetic variation across the state. We started imaging adult specimens in December 2023 and Andrea Egizi started extracting the DNA and amplifying the cox 1 locus from samples in January 2024. We will share preliminary results at the NJMCA annual meeting in March 2024.

# OUT OF THE COCOON: JOBS AND CAREERS IN ENTOMOLOGY

## Dina Fonseca

Contrary to common perception, entomology isn't only studying bugs; it's studying the intricate web of life they contribute to. Insects play vital roles that often go unnoticed: they are predators as well as prey, pollinators as well as decomposers, and can serve as indicators of environmental and animal health. As ecosystems face unprecedented challenges, the role of entomologists in safeguarding delicate ecological balances is becoming increasingly crucial.

And the microcosm of insect life presents a vast landscape for research, discovery, and job opportunities. Fruit flies are a fundamental model organism in basic and applied science that has helped unravel the intricacies of inheritance, gene regulation, and developmental biology. Insects can also destroy crops and transmit disease-causing parasites and pathogens, so there is a need to strategically prevent, detect, and manage those insects. Beyond research and control, entrepreneurial opportunities are diverse and forward-thinking from insect farming for sustainable protein production to development of biodegradable materials and robots inspired by insect exoskeletons and wings. Groundbreaking discoveries that can shape our understanding of life and how to continue living on Earth await those that study insects.

As interest in entomology grows, so does the need for educators. Job opportunities in teaching entomology extend beyond traditional classrooms, reaching into nature centers, museums, community outreach programs, and citizen science projects. Sharing the wonders of the insect world not only imparts knowledge but also fosters a deeper appreciation for the interconnectedness of all living things.

For more information about careers in entomology, consider enrolling in 11:370:407: Careers and Professional Development in Entomology, 1 credit, spring semester.

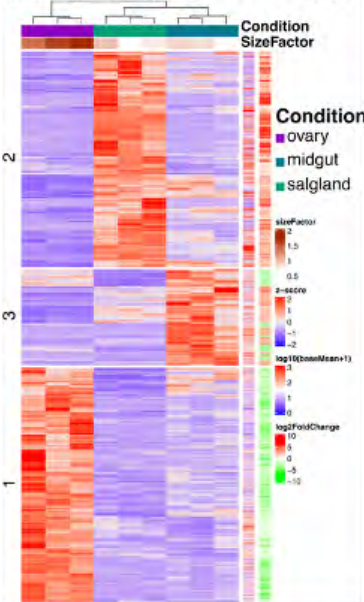


# SEQUENCING TICK TRANSCRIPTOMES & THEIR PATHOGENS

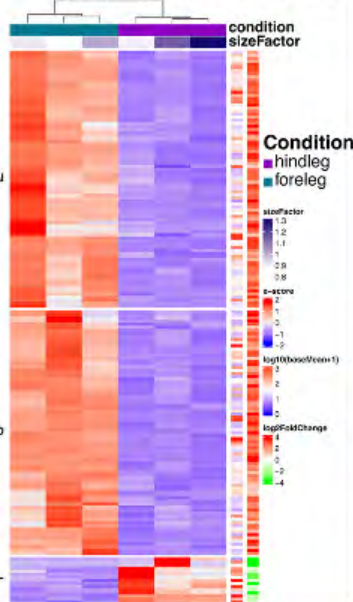
Mohamed Moustafa



6220 significant genes with FDR < 0.05



177 significant genes with FDR < 0.05



I presented our analysis of transcriptomic differences across Asian longhorned tick tissues at the Conference of Research Workers in

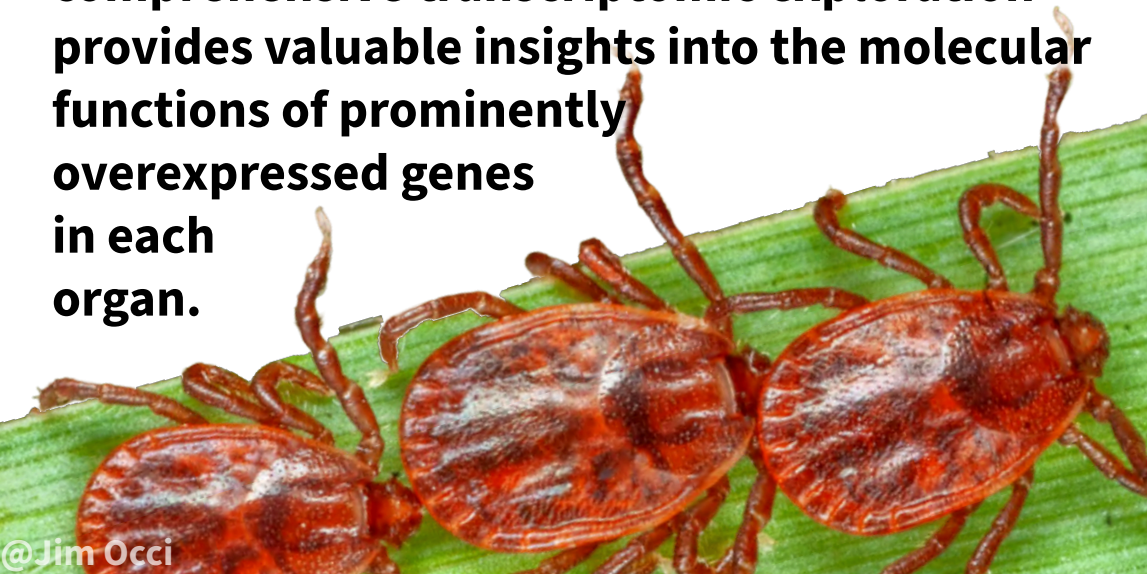
Animal Diseases. Using high-throughput RNA-seq technology, we explored gene expression profiles across various tick tissues. We observed significant differences among ovaries, midguts, and salivary glands. This comprehensive transcriptomic exploration provides valuable insights into the molecular functions of prominently overexpressed genes in each organ.

**PANOLA**

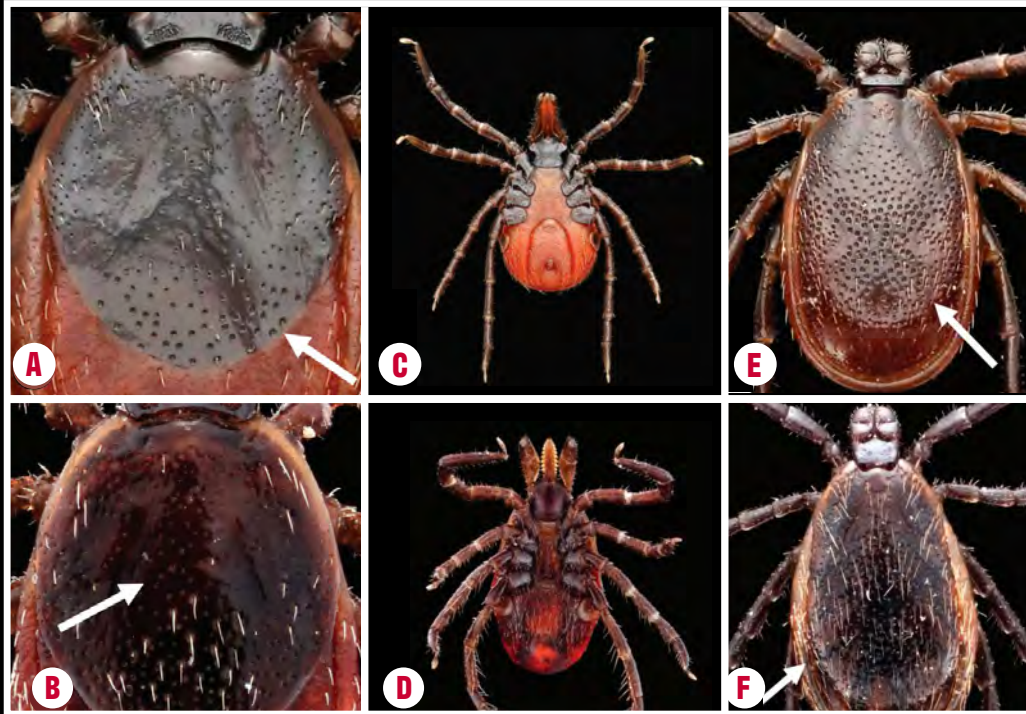
**MOUNTAIN**

***EHRlichia*:**

We are using selective whole genome sequencing (SWGA) to examine the entire genome of a Panola Mountain *Ehrlichia* we detected in an *Amblyomma americanum* in NJ. This work holds promise for further understanding the genomic characteristics of this *Ehrlichia* strain.



# NEW TICK IN TOWN

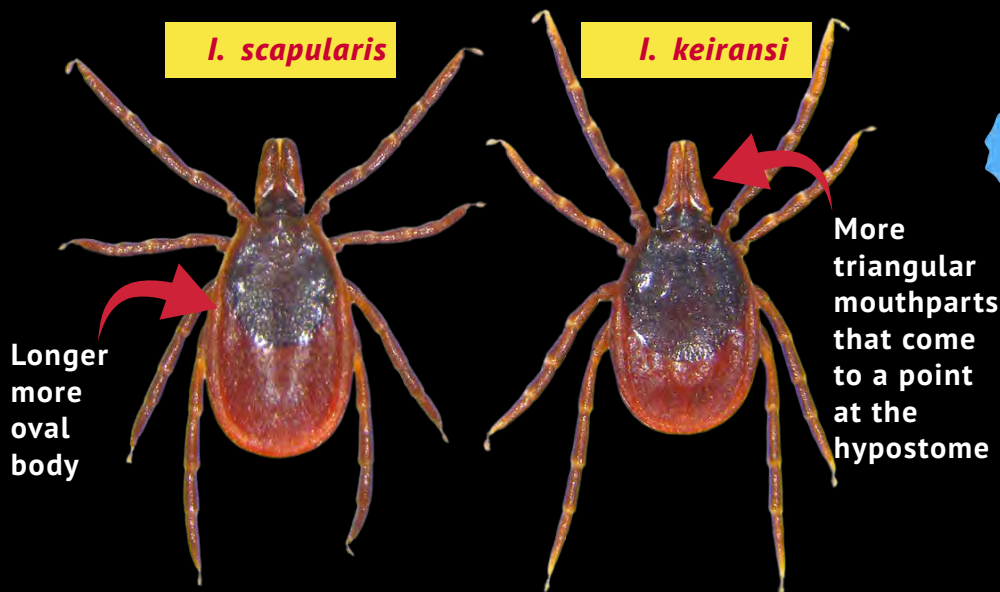


## DIFFERENCES: *IX. KEIRANSI* vs. *IX. SCAPULARIS*

*Ixodes keiransi* (A) have deeper more pronounced punctations on the posterior part of their scutum whereas *Ixodes scapularis* (B) have finer less pronounced punctations that are evenly distributed. These punctation patterns stay consistent in both females and males of the same species (A) (E) vs (B) (F). Furthermore, *Ixodes scapularis* have many hairlike bristles, known as setae, which can be seen dorsally and ventrally in males and females (B) (D) (F). *Ixodes keiransi* also have setae but they are more sparsely distributed (A) (C) (E) (Nadolny et al., 2021).

## Zoe Narvaez

This past summer we found *Ixodes keiransi* (formerly *Ixodes affinis*) at one location in southern NJ. *Ix. keiransi* was historically limited to the southern US, and NJ is now the northernmost (known) part of its range. While it doesn't bite humans, it does play a role in the enzootic maintenance of *Borrelia burgdorferi*, as well as other members of the *B. burgdorferi* sensu lato complex. Also, it is very morphologically similar to *Ix. scapularis*, so it is important for field researchers to be aware of this lookalike (Narvaez et al. 2024 accepted).



Rutgers undergrad flagging for ticks!

# PERPLEXING PIPIENS

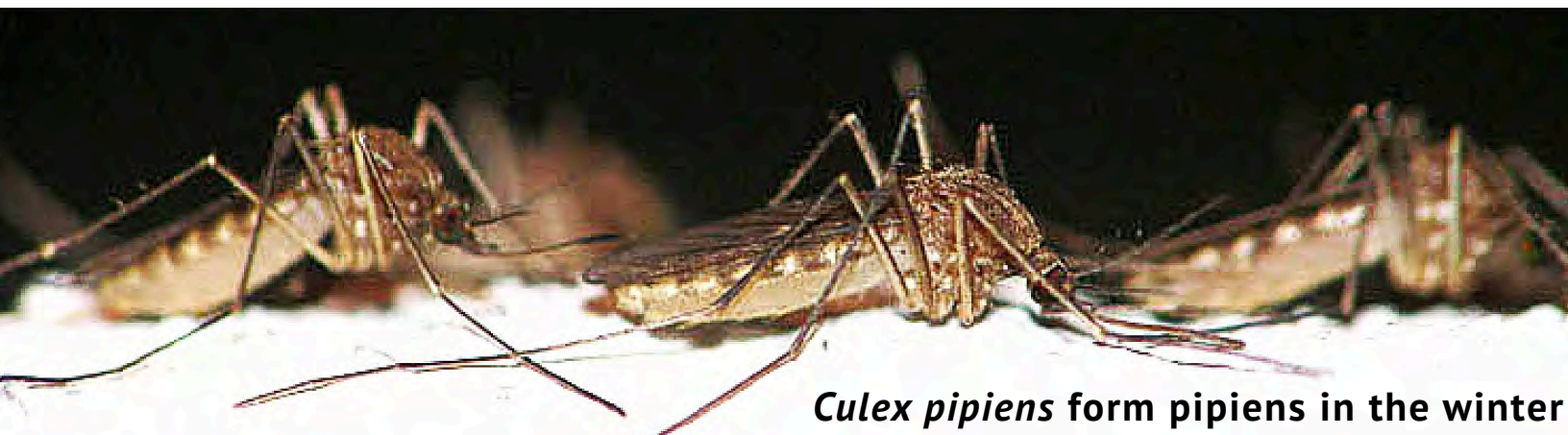
**Nicole  
Wagner**



The northern house mosquito, *Culex pipiens*, includes form *pipiens* and form *molestus*, that look identical but act very differently. In the winter adult females of form *pipiens*, fat from the sugar they gorged on in the fall, cover the walls of cool basements and underground bunkers waiting for the spring. During the active season female *Cx. pipiens* form *pipiens* blood feed on birds. They will not mate in a cage.

In contrast, *Cx. pipiens* form *molestus* is active all year, which at northern latitudes means staying underground inside sewers and metro tunnels created by humans. When needed, form *molestus* blood feeds on rats and humans and will mate in very small spaces, even a test tube. Sometimes, the two forms mate creating specimens with a mix of traits. This mix can determine the likelihood they will transmit disease-causing viruses and other pathogens to humans.

In November 2022, mosquito control professionals in the US state of Washington found active 1st to 4th instar *Culex pipiens* larvae in shallow catch basins. At their northern latitude in November all *Cx. pipiens* should be hibernating adults. Wanting to know why larvae were found, they sent us specimens for testing. The genetic analyses using nuclear DNA markers detected genetic mixes of forms *molestus* and *pipiens*. In fact, careful calculations found an excessive number of mixes, possibly indicating positive selection. Other analyses including metagenomic sequencing of several specimens from both 2022 and new specimens from 2023, is ongoing. Understanding the genetic makeup of these populations may provide critical information about recent changes in microclimate at very fine scales.



*Culex pipiens* form *pipiens* in the winter



# ESA 2023 RECAP

## Grayson Tung

November 5-8, National Harbor, MD. Almost everyone attended and presented their research at the annual meeting of the Entomological Society of America (ESA). Zoe Narvaez and Stephanie Zapata competed in the Medical, Urban, and Veterinary Entomology (MUVE) student competition with Zoe receiving a 1st place prize for her presentation. Dr. Alvaro Toledo presented on strategies to control the Asian longhorned tick. Dr. Dana Price presented his work on mosquito and tick microbiomes. Because Heidi Herb fell ill, Dr. Fonseca presented her work on human and animal parasites in ticks. Emily Fontaine presented her work with "NJ Ticks 4 Science!" in the science policy symposium "How Can We as Entomologists Affect Public Policy Through Citizen Science?". Grayson Tung moderated a MUVE 10-minute paper section and presented his work on the effects of juvenile hormone on adult blood feeding. Dr. Fonseca described the use of robots for tick control in the symposium "Futures of Entomology: Managing Invasive Species and Novel Agricultural Approaches". Dr. Hend Abdullah shared her work on the discovery and optimization of nuclear DNA markers to study patterns of expansion of the Asian longhorned tick across the US. Dr. Andrea Egizi gave a talk titled, "Ticks don't stop at the border: Exotic ticks in the US and preventing future threats". Members of CVB were also able to catch up with recent alumni Dr. Francisco Ferreira and Dr. Julia Gonzalez (CVB Gang).



**ZOE, STEPH & JEN**



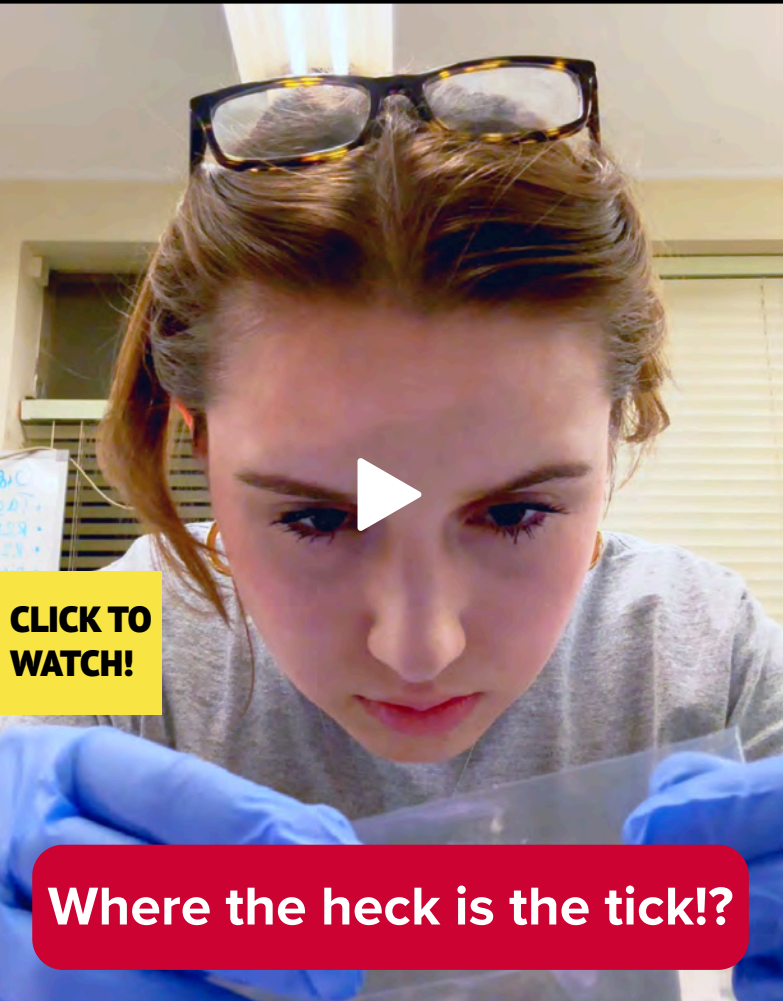
**CVB GANG!**



**DINA FONSECA**



# NJ TICKS 4 SCIENCE! GOES VIRAL

















CLICK TO  
WATCH!

Where the heck is the tick!?

VIEWS	LIKES	SAVES	COMMENTS
37.7K	1685	16	7

## COMMENTS

-  dogsandrinning  
🤔WHERE THE HECK IS THE TICK🤔  
2023-12... Reply  89
-  jaclyn  
what would have happened if you didn't find it  
2023-12... Reply  15
-  NJ Ticks 4 Science! · **Creator**  
Good question! Unfortunately, without a tick we can't test it.  
2023-12... Reply  0
-  NJ Ticks 4 Science! · **Creator**  
We are currently making improvements to our website to be able to communicate with submitters in case something like this happens!  
2023-12... Reply  5
-  watevafloatsurboat  
Do you accept ticks from other states? Also fyp  
2023-12... Reply  11
-  NJ Ticks 4 Science! · **Creator**  
We only accept ticks found in New Jersey, but thanks for your interest in our program!!  
2023-12... Reply  11
-  gar  
I ATE IT  
2023-12... Reply  1

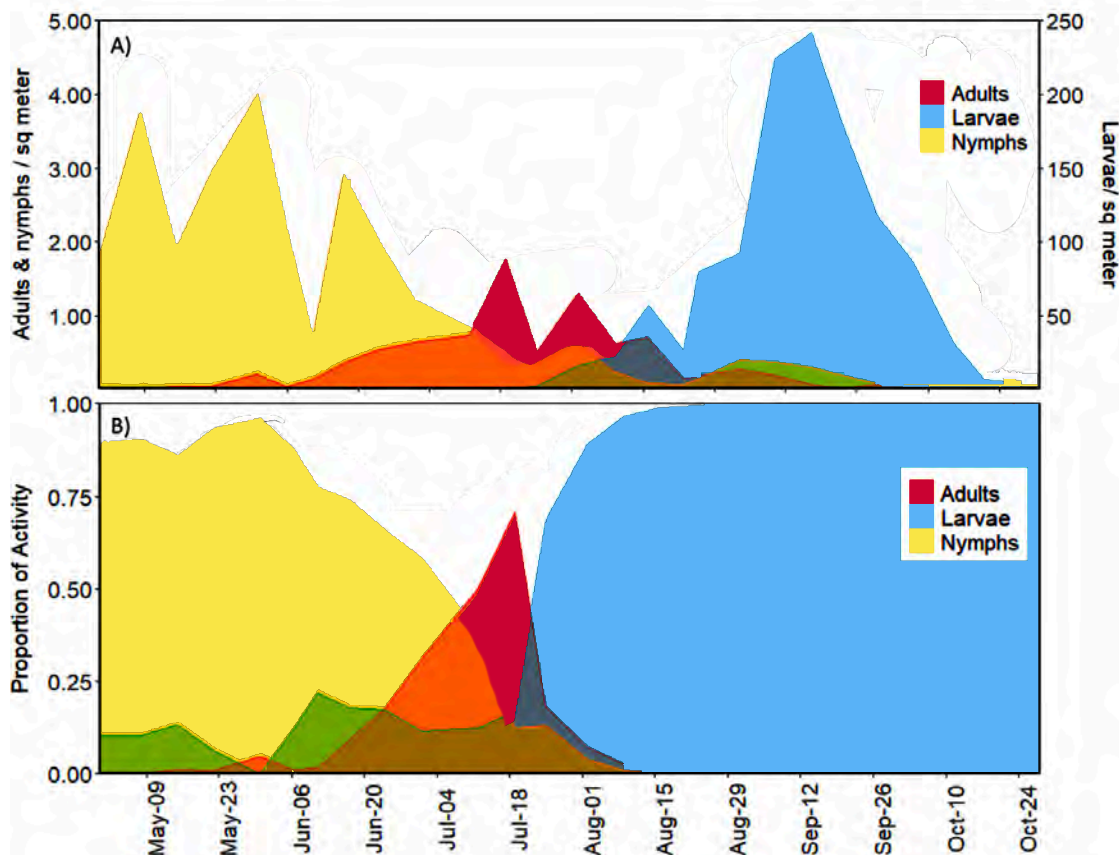
### Emily Fontaine

I often film myself opening tick mail for the "NJ Ticks 4 Science!" social media accounts. In this instance, I opened the envelope and took out a plastic baggie that had a tick ID number but no tick! At the bottom of the bag I noticed the tiniest hole—the hole can even be seen in the submission photo! The tiny hole ended up being just big enough for the tick to escape! Luckily, after a brief panic and some further investigation I found the tick loose in the envelope! My most dramaTICK piece of tick mail yet!

# ACARICIDES & ASIAN LONGHORNED TICKS

**Alvaro Toledo**

In my laboratory, we are studying approaches to control *Haemaphysalis longicornis*, a parthenogenetic tick species that frequently parasites cattle and pets and vectors human and animal pathogens. We recently published an article studying the susceptibility of the Asian longhorned tick to different acaricides and found that currently, resistance is not a concern. However, responsible integrated management and early detection of resistance can help ensure the long-term efficacy of products used for controlling this tick species ([Bickerton et al., 2023](#)).



Seasonality of host-seeking *Haemaphysalis longicornis*. A) Weekly tick densities, by life stage, from 30-April to 28-October 2019, and B) Proportion of overall activity (total tick numbers) contributed by nymphs, adults, and larvae by week ([Bickerton et al., 2021](#)).



# GIGANTICK ARACHNID!

@Jim Occi



**Jim Occi**

You think the ticks in Jersey are bad? Look at the size of the *Ixodes acutitarsus* from Tibet (photographed next to a NJ blacklegged deer tick). In Taiwan *Ixodes acutitarsus* has even been reported feeding on humans (Chao, Shih 2011). How about finding that feeding on you??!!

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