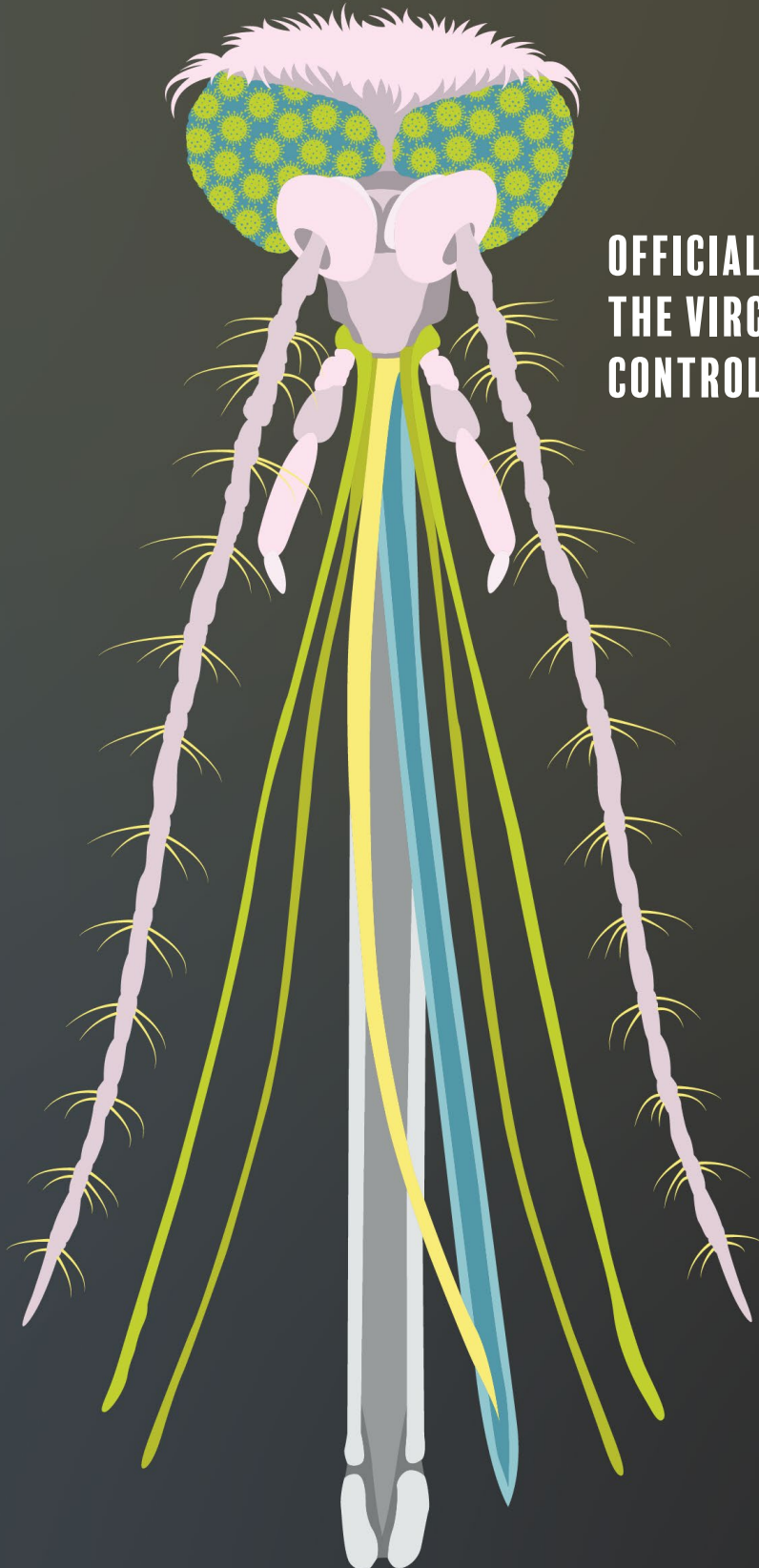


THE SKEETER

VOL. 81. NO.1

2021 SPRING NEWSLETTER



OFFICIAL NEWSLETTER OF
THE VIRGINIA MOSQUITO
CONTROL ASSOCIATION

PRESIDENT'S ADDRESS

VMCA Members,

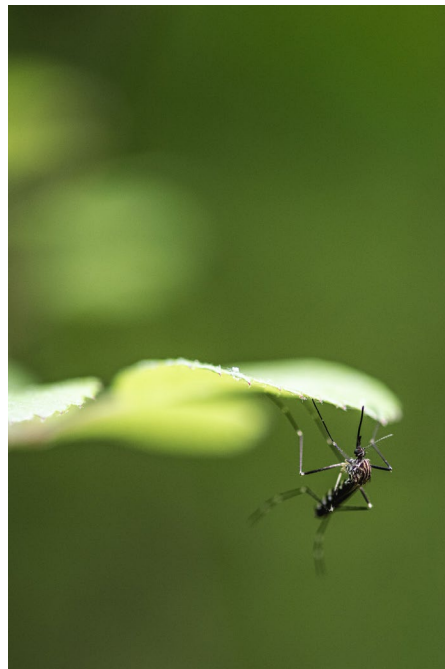
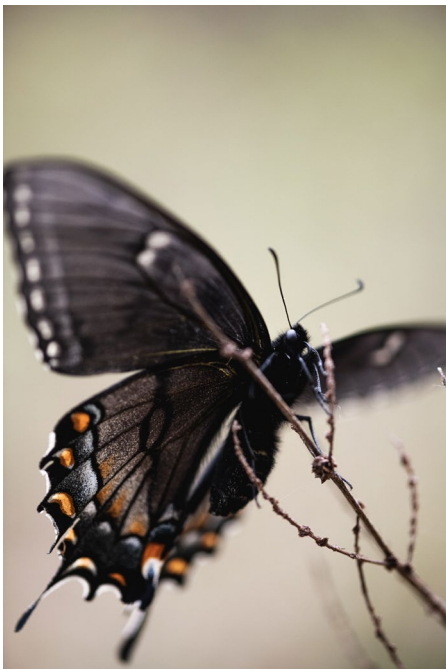
The 2021 Season is upon us, and though the weather has not figured out what it wants to do, we have seen plenty of activity throughout Virginia. At the time of this writing, Southeastern Virginia has seen no observable rainfall for the past three weeks, and I believe it is similar in other parts of the state. As we all know, the weather can change on a dime and we could have a heavy rainfall cycle just around the corner.

The VMCA had a very successful first run at the virtual conference in January, and we hope that everyone was able to attend and pull new information out to use this season. If you were unable, and would like to see the recordings, pop on over to the associations website to catch up. Speaking of the associations website, there are other major updates recently that you could check out including our 2021 ID Course, information on the 2021 Tour de Skeeter, which is scheduled for June 19 th on the Capital to Capital Trail, recent job opportunities, merchandise sales, and so much more. Also keep an eye on the webpage for info regarding the 2022 Annual Conference next January in Newport News. 2022 will be the 75 th Anniversary of VMCA, and I'm sure we are all ready to see our friends and coworkers face to face.

Enjoy this packed edition of The Skeeter and have an fun and productive season!

-Tim DuBois

2021 VMCA President



The bugs are back in town! Have any cool insect photos you've shot this season? Send them to the [editor](#) to feature in the next edition of the Skeeter!

ANNOUNCEMENTS

VMCA ORGANIZATIONAL MAILING ADDRESS

Virginia Mosquito Control Association
Jay Kiser, Secretary/Treasurer
800 Carolina Rd
Suffolk, VA 23434
Phone: (757) 514-7608
Email: virginiamosquito@gmail.com

YOU CAN SIGN UP FOR OR RENEW YOUR VMCA
MEMBERSHIP ONLINE! VISIT OUR WEBSITE AND
FILL OUT THE FORM [HERE](#)

WHAT'S IN THIS ISSUE

Announcements, What's That?

2021 Virtual VMCA Meeting

TMVCC Notes

Virtual Adult ID Course

Updating Board and Committee Guidelines

Silent Auction 2022

VMCA Book Club

2021 Tour de Skeeter

A Repository for Mosquito Abundance Data

2021 Student Poster Competition Winner

Brood X-ellence

Adapco Spotlight on Chesapeake

What's That? Answer

2021 Sustaining Members

Jurisdictions & Other Resources

2020 Executive Board

[3](#)

[4-5](#)

[5](#)

[6-7](#)

[7](#)

[8](#)

[9](#)

[10](#)

[11](#)

[12](#)

[13](#)

[14-17](#)

[18](#)

[19](#)

[20](#)

[21](#)

UPCOMING EVENTS

3rd Annual [Tour de Skeeter](#)

June 19, 2021

Late registration deadline June 17
Jamestown to Richmond, VA

National Mosquito Control Awareness [Week](#)

June 20-26, 2021

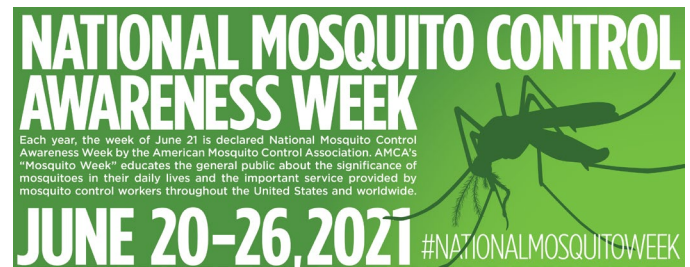
NCMVCA Virtual Annual [Conference](#)

November 9-10, 2021

AMCA 88th Annual [Meeting](#)

February 28- March 4, 2022

Jacksonville, FL



Here are a few ideas on how you can get the word out!

Distribute a press release.

Contact your local radio station and offer to be a guest expert.

Contact your local elementary school and offer to talk about mosquitoes.

Contact your local girl scout or boy scout troop and offer to teach about mosquitoes.

Set up an informational display in your community.

Hold an open house at your district.

Set up a tire drive.

Distribute repellent packets in your community.

AMCA wants to hear from you after your event(s). Don't forget to take pictures and report back to AMCA at amca@mosquito.org.



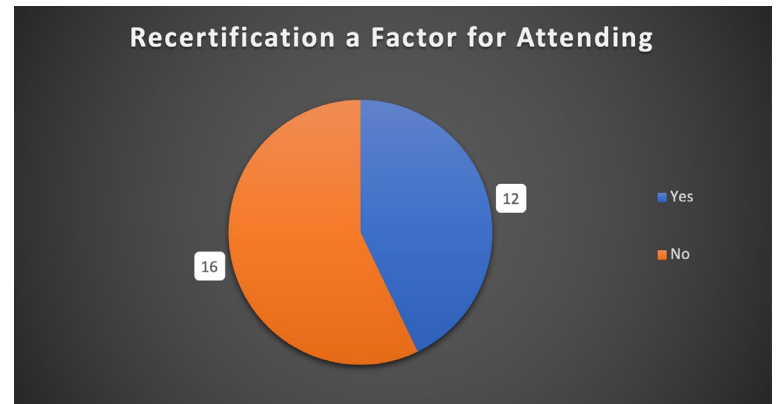
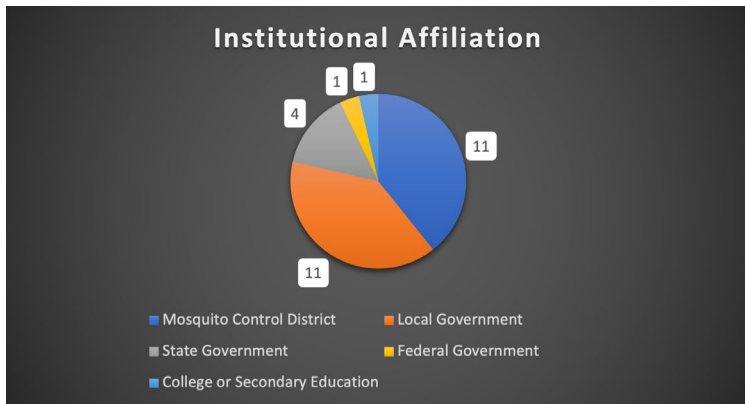
WHAT'S THAT...?

Answer on [page 18](#)

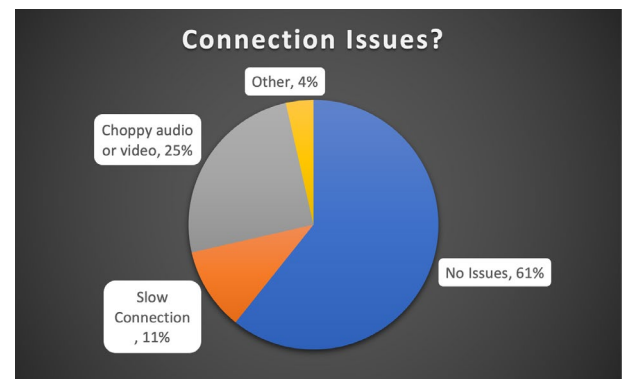
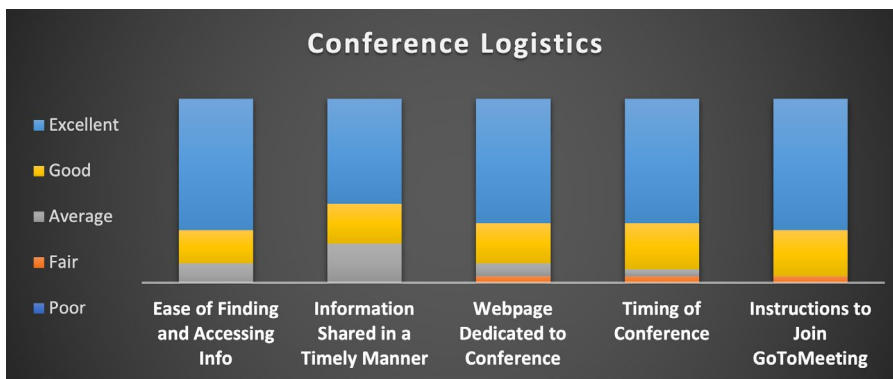
2021 VIRTUAL VMCA MEETING

Despite the unprecedented circumstances, VMCA managed to salvage its 2021 conference by pivoting to an all-digital format. The effort behind the transition, as well as the overall experience, was seemingly well received based upon the 28 respondents to our annual survey.

A quick breakdown of survey participants yielded no surprises with majority of respondents hailing from local municipalities. Furthermore, in regard to recertification, more than half of respondents say that it's not a factor for them when deciding upon attending.



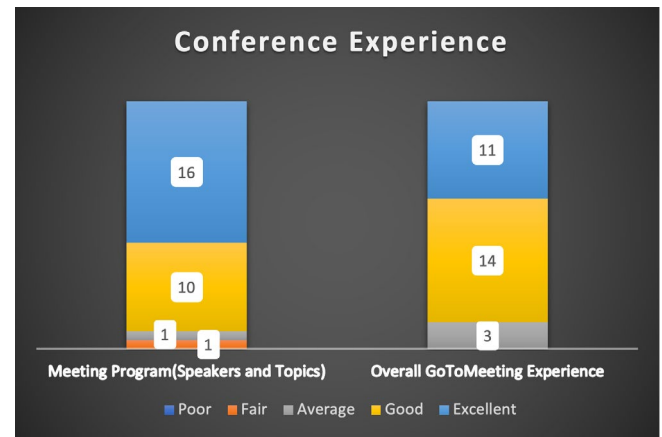
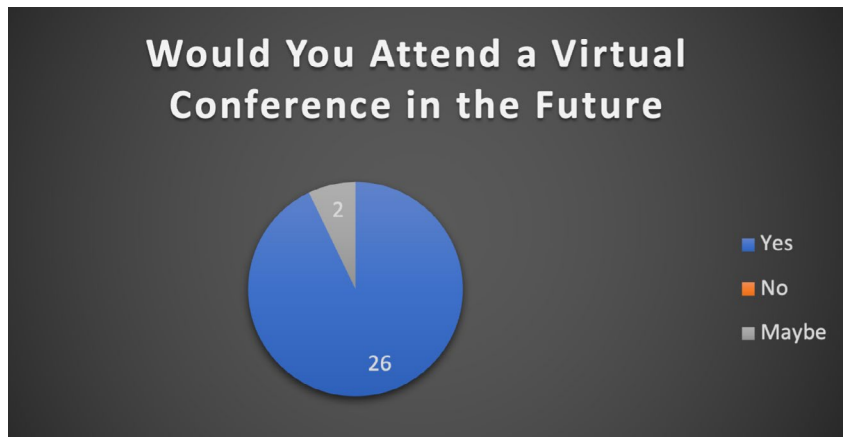
Moving on, the chart labeled 'Conference Logistics' encompasses five of the survey questions that I felt were all strongly related. Respondents returned high marks across the board with *Ease of Finding and Accessing Info* performing the strongest of the group. Conversely, survey participants shared a bit more of a mixed appreciation to *Information Shared in a Timely Manner*. *The Webpage Dedicated to Conference*, *Timing of Conference*, and *Instructions to Join GoToMeeting* all returned at least one mark of 'Fair'.



Technical difficulties the days of the conference proved to be limited with just 39% of respondents reporting some form of technical hindrance. Of those replies, 25% of them cited *choppy audio or visual* as their chief complaint while just 11% marked a slow connection as their primary grievance.

In summary, respondents overwhelmingly approved of the *Meeting Program* as well as the *Overall GoToMeeting Experience*, culminating in nearly all survey takers indicating that they would attend a virtual meeting in the future.

It is the sole opinion of my own, but one that I am confident others share, that VMCA's virtual conference was a success. In hindsight, as the reviewer of the survey data, I feel that there might have been some value in polling whether respondents had presented or not. However, the lack of that data does not take away from my opinion that the virtual conference was successful.



-Submitted by Francis Valera, VMCA First Vice President

TMVCC NOTES

Hello all.

Well, the Tidewater Mosquito and Vector Control Council (TMVCC) does not have any upcoming lunch meetings thus far. The rodeo will not be a gathering again this year because of COVID-19 pandemic. An email was sent out on April 12th requesting that if your locality wanted a calibration done on your spray trucks, to call Jeff Hottenstein at (703)498-9362 to set an appointment to have that done. On another note, we are still looking for a secretary for the 2021 year; if you are interested, please contact Luz Grant at luz.grant@vdh.virginia.gov, or me.

I will keep everyone informed if a meeting should become possible. Until then, the TMVCC committee wishes everyone a happy and safe mosquito season!

Thank you,

Ann Herring, President

TMVCC

800 Carolina Road

Suffolk, VA 23434

757-514-7608 office

757-923-2484 fax

mherring@suffolkva.us

VIRTUAL ADULT MOSQUITO ID COURSE

The VMCA's Education Committee has put together a virtual mosquito identification course this year. As usual, the course is FREE and conducted through the combined effort of Virginia mosquito control biologists and entomologists. The presentations are pre-recorded and are available for viewing at your convenience on the VMCA website on the [Adult Mosquito ID Course page](#).

This course is not strict taxonomy but is more of a practical training geared toward seasonal interns, field technicians, or biologists new to the area who will be performing adult mosquito speciation. The course will cover general mosquito information including anatomy, bionomics, diseases, fieldwork concerns, and laboratory protocols. Those species occurring in Virginia will be the focus; genera covered include *Aedes*, *Anopheles*, *Coquillettidia*, *Culex*, *Culiseta*, *Orthopodomyia*, *Psorophora*, *Toxorhynchites*, and *Uranotaenia*.

Normally when VMCA hosts this course, it is done live and there are hands-on specimen ID sections to practice identifying species in each genus. Therefore, in order to get the most out of this virtual course, it is recommended (*not required*) that you have access to the following:

- Adult mosquito specimens
- Microscope
- The Mosquitoes of the Mid-Atlantic Region Identification Guide (available for purchase [here](#) or you can download the order form on the [ID course page](#) of the website)
- A biologist or supervisor who can help with hands-on specimen identification and of whom you can ask questions

Presentation Topics/speakers include:

Integrated Pest Management (IPM) and Mosquito Biology

Wes Robertson

Henrico County Public Works

Critters Encountered in the Field

Lisa Wagenbrenner

Chesapeake Mosquito Control Commission

Trapping Demonstration

Janice Pulver

York County Mosquito Control

Microscope Use, Specimen Manipulation,
and Using a Dichotomous Key

Jay Kiser

City of Suffolk Mosquito Control

Aedes

Jay Kiser

City of Suffolk Mosquito Control

Anopheles

Michael Bowry

City of Hampton Public Works

Culex

Karen Akaratovic

City of Suffolk Mosquito Control

"Minor" genera: *Coquillettidia*, *Culiseta*,
Orthopodomyia, *Toxorhynchites*, and *Uranotaenia*

Psorophora

Jennifer Barritt

City of Virginia Beach Mosquito Control

Penelope Smelser

City of Norfolk Vector Control

For each presentation, you may contact the speaker regarding their material if they have their contact information listed within their presentation. If a speaker's contact information is not listed or for any other questions please email virginiamosquito@gmail.com.

If you decide to view any part of the course, please take a moment and fill out the brief survey that is posted on that page. We truly value your feedback in determining how useful this platform is and whether we should continue to offer this option going forward.



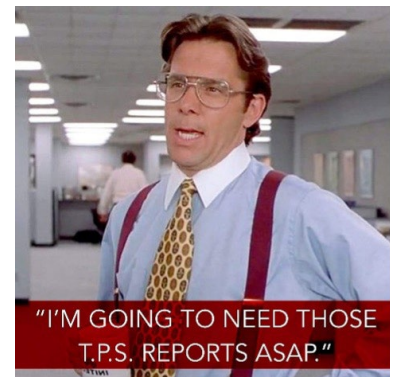
Above photos from past in-person ID courses (we hope to have again in the future!)

UPDATING BOARD AND COMMITTEE GUIDELINES

Updating the Guidelines for VMCA Board and Committee Members

If you didn't already know, there is a document on the VMCA website that contains the details and responsibilities for committees and VMCA board members; <https://mosquito-va.org/bylaws>. If you are interested in joining a committee or the VMCA executive board, this is a great place to see all the duties for those positions.

In 2021, the VMCA Bylaws Committee will be updating these guidelines. Every five years the guidelines need to be revisited, modernized, and agreed upon. Committee chairs and board members have been asked to review their sections. If you are a committee member or just an interested VMCA member, please take a look. If you have any suggested changes or updates, email them to jkiser@suffolkva.us.



SILENT AUCTION 2022

PLEASE DONATE

All proceeds benefit the VMCA Student Poster Competition

**Silent Auction taking place during the
2022 VMCA Annual Meeting
January 25-27, 2022**

**Please drop off items at the meeting registration desk by Noon,
January 25, 2022**

Items may also be sent/dropped off before the meeting to:

We are looking for a variety of new or gently used items of good quality including, but not limited to:

Vector themed items Tools
Artwork Antiques/Historical items
Gift certificates Treasures
Themed prize baskets Apparel

Group donations by committee, agency, or vendors are always appreciated.

Suffolk Mosquito Control, 800 Carolina Road, Suffolk, VA 23434

For more information please contact: [Ann Herring mherring@suffolkva.us](mailto:Ann.Herring@suffolkva.us)

2021 TOUR DE SKEETER

The Student Competition Committee is hosting the third annual Tour de Skeeter fundraising event on Saturday, June 19, 2021. This event will be taking place at Indian Fields Tavern on the Virginia Capital Trail between Jamestown and Richmond. After being cooped up all year, let's get out of the house and socialize with our mosquito colleagues (while socially distancing, that is). You can bike, walk, or just meet at the tavern for food, drinks, and conversation. At the Tavern, the SCC will provide a collection of appetizers for participants while drinks and lunch can be purchased on your own. ([More Details](#) on the event).

Registration details:

Regular registration deadline has passed (May 27), but we are offering late registration (\$20) up until the event. Late registration does not include the quick-dry t-shirt, but it does include a TdS tote with other goodies, light fare at the Indian Fields Tavern, and a chance to win a \$200 Amazon gift card. [Click here for late registration and payment](#). Proceeds from registrations will go towards the VMCA Student Poster Competition and fundraising events. **Please come out and help support vector-borne research.**

*****All registered participants will be entered into a drawing to win a \$200 Amazon Gift Card.***
You do not need to be present at the event to win.**



\$200 Amazon gift card drawing and estimated look of 2021 Tour de Skeeter quick dry t-shirt.



The Virginia Capital Trail ([Map](#)) is a 52 mile paved trail that runs from Jamestown to Richmond Virginia. Before and after the tavern time, you can bike ride, jog, skateboard or walk on the trail as much or as little as you would like. Bring your families, join up with friends, or go solo. Last year, groups of bike riders met in Jamestown and Richmond to ride and meet up at the Tavern (roughly mile marker 22 on the trail). Another group met up at the tavern to ride locally. There are additional parking lots on the trail where people can meet up as well.

Meeting Location:

Indian Fields Tavern (12-4 PM)
9220 John Tyler Memorial Highway
(near mile marker 22)
Charles City, VA 23030
(804) 829-2200

A REPOSITORY FOR MOSQUITO ABUNDANCE DATA

Stephen Panossian, Maryland Department of Agriculture

Hi! I am Stephen Panossian, a mosquito control professional since 2013 at the Maryland Department of Agriculture's Mosquito Control Field Office in College Park. This field office conducts mosquito control primarily in Prince George's and Howard counties. We also perform mosquito surveillance in Prince George's County to support night spraying and arbovirus testing. As with many mosquito control offices, the mosquitoes we catch are identified and logged, and over the years we have accumulated many spreadsheets of this abundance data. In fact, I have located MDA logs dating back as early as the 1950s! However, most of this data has been used internally within MDA's Mosquito Control Section. So naturally a question arises: does this data have value to researchers at large?

If your organization is willing to release its data, one option is submitting an annual species summary to VectorBase.org, a part of the VEuPathDB project. (VeuPathDB.org is a collaboration between NIH's National Institute for Allergy and Infectious Diseases and the Wellcome Trust in England that centralizes eukaryotic pathogen, vector and host data). Most mosquito control staff are acquainted with ArcGIS software to map local population counts, and VectorBase has its own global mapping tool, MapVEu, as an option. Those that explore MapVEu will find mosquito data as early as the 1980s, and not only are species and pathogen counts per location displayed, but also insecticide resistance, blood meal host, and various genetic information. A user can also search by date range or season. VectorBase also features online help and a glossary. Recently I submitted mosquito abundance data collected from our field office (for Prince George's and the part of the Patuxent Wildlife Refuge Center extending into Anne Arundel county) spanning the years 1999 through last season, 2020. How do you submit data to VectorBase? First, read this paper by Rund et al. describing the MIREAD data format that best works with VectorBase. Essentially a MIREAD Excel table begins with several records at the top describing your submitted data. Next, you list the trapping start and end dates, trap type and any lures, any trap malfunctions, location (latitude and longitude), life stage, male or female indicator, followed by your species counts. The research paper also gives examples of different table layouts depending on the type of data you record. Once you have your dataset prepared, you can create an account and upload it. Also, note that the MIREAD format is flexible for insects other than mosquitoes. If you search MapVEu you will also display records of other arbovectors like ticks.

Lastly, if your organization prefers to publish its dataset(s) itself and make it available on the Internet to download or link to, I recommend reading the online PLoS article "[How to Store and Manage Your Data](#)" for suggestions and recommended repositories. Perhaps the datasets you provide will be useful to researchers conducting time series analysis of mosquito populations, or determining the invasion/spread of a species, or studying the long-term effects of urbanization and/or climate change on species distribution.

References:

PLOS.org. (n.d.). How to Store and Manage Your Data. *PLOS Writing Center*. Referenced from plos.org/resource/how-to-store-and-manage-your-data.

Rund, S.S.C., Braak, K., Cator, L. *et al.* MIREAD, a minimum information standard for reporting arthropod abundance data. *Scientific Data*, **6**, 40 (2019). <https://doi.org/10.1038/s41597-019-0042-5>

2021 VMCA STUDENT POSTER COMPETITION WINNER

Muscarinic-Selective Target-site Synergism as a New Mosquito Control Strategy

Na Xie and Aaron D. Gross

Molecular Physiology and Toxicology Laboratory, Department of Entomology
Virginia Polytechnic Institute and State University
Blacksburg, VA, USA

Mosquitoes are one of the deadliest animals on the planet, where they are vectors of the causative agents that result in several mosquito-borne diseases (e.g., malaria, dengue fever, etc.). Insecticides are commonly used to control mosquito populations and further diminish the impact of vector-borne diseases. However, the rapid evolution of resistance is diminishing the effectiveness of insecticides and is impeding mosquito management that negatively impacts animal and public health. Therefore, there is a critical need to develop new strategies to help control mosquito-borne illness. Insecticide mixtures are a potential strategy to mitigate resistant populations. With insecticide mixtures, it is expected that the components of a mixture can potentiate each other through modifying different physiological systems, which is commonly referred to as target-site synergism or joint action.

Muscarinic acetylcholine receptors (mAChRs) are a subfamily of G-protein coupled receptors and are an important component of the cholinergic system in insects. While developed insecticides target the insect cholinergic system (e.g., neonicotinoids, organophosphates, and carbamates); there are no commercialized products targeting mAChRs. Whereas gamma-aminobutyric acid (GABA)-gated chloride channels (GABA_A receptors) are an established target for different types of insecticides, like gamma-hexachlorocyclohexane (e.g., lindane), cyclodienes (e.g., dieldrin) and phenylpyrazoles (e.g., fipronil). Muscarinic and GABA_A receptors are physiologically indispensable components in the insect nervous system where they are involved in mediating various physiological activities. In my study, pilocarpine (not an insecticide), a non-selective muscarinic compound that activates mAChRs and was utilized to investigate the target-site synergism with inhibitors of GABA_A receptors in *Drosophila melanogaster* (the common fruit flies).

I used *D. melanogaster* because it is an excellent model organism for toxicological, physiological, and interdisciplinary studies. I found that in susceptible adult *D. melanogaster*, the mixture of pilocarpine significantly increased the oral toxicity of GABAergic insecticides: fipronil, lindane, and dieldrin (i.e., pilocarpine made these insecticides work better). Unexpectedly, the enhancement of fipronil, dieldrin, and lindane (GABAergic insecticides) by pilocarpine was abolished in the resistant strain of *D. melanogaster* carrying a point mutation in the GABA receptor (*Rdl*). By performing extracellular electrophysiology in the larval stage of *D. melanogaster*, pilocarpine was found to be able to increase the neural inhibition of lindane. Specifically, pilocarpine lowered lindane's inhibition of the nervous system in both the susceptible and resistant strains, but inhibition was greater in the susceptible strain of *D. melanogaster* because the point mutation alters the efficacy of lindane's "blocking" effect of GABA_A.

In conclusion, this work suggested that perturbation of the muscarinic system enhances the toxicity of insecticides inhibiting GABA_A receptors, indicating the potential for developing muscarinic-selective target-site synergists to control mosquito populations, but further work will have to be performed on how to overcome the *Rdl* mutation.

BROOD X-ELLENCE

“Brood X-ellence”

Written and performed by MC Bugg-Z
Audio production by Kelton Williams
Cicada footage courtesy of Greg Holmes

CHECK OUT THE LATEST RELEASE FROM
ENTO-RAPPER MC BUGG-Z [HERE!](#)

Brood X / Periodical cicada / it's Brood Ten /
Brood X / Periodical cicada / it's Brood Ten /
Brood X / Periodical cicada / it's Brood Ten...and it's

Brood X-cellent to see you again / I been / chillin' underground with my friends / sippin' on root juices / 17 years as a nymph / ditchin' this skin / for tymbals, genitalia and tent-like wings / 'cause did I mention I sing? And we're emergin' by the billions? 6 weeks disruptin' these civilians/ it's a fitness thing / you're witnessing predator satiation / overload / by dispersin' in droves / then get to matin' /

Brood X / Periodical cicada / it's Brood Ten / up from the underground / demandin' attention / we've been irrelevant but everything's about to change / check out the chorus from my family / Cicadidae / *Macicicada's* the genus / three species beneath it / *septendecula*, *septendecim* and the smallest, *cassini* / 4 to 6 weeks of my singin' / ears will be ringin' / believe me / embracin' the spectacle / 'cause the emergence is fleeting /

my life cycle is *egg, five nymphal stages, adult* / playin' that super long game / with impressive results / fossorial front legs / that are used to excavate / yeah, we can dig it / all up in it / and ready to captivate / see all the nutrients I need / are found beneath the trees where I was conceived / now tappin' all of these roots predator-free / fell from branches / the size of a grain of rice and hungry / loyal to soil / dug in / where nobody can hunt me

biding my time below / while people stroll up above / 17 years of sippin' sap / through four molts / almost done ready to give the world a True Bug hug / circadian rhythms / preppin' my exit to the surface because / when the soil temp / at 8" depth / is 64 degrees F / make my final ascent to represent / ground is riddled with half-inch tunnels / up in your COVID bubble / to sing with trillions of my friends and cuddle /

in some places we'll number / hundreds of thousands per acre / 100 decibels drummin' when I'm shakin' my money maker / listenin' for wing clicks from cicada ladies / that's how I know we're vibin' / and I been constantly hollerin' lately / like phaaaaaaaaaaaaaaaaaaraoh / Great Eastern Brood unbound / unique and world-renowned when my folks were doin' what I'm doin' now / Usher's "Yeah" was number one / and I was just a baby headed underground /

Brood X / Periodical Cicada / it's Brood Ten /
Brood X / *Magicicada* / they're back again
Brood X / Periodical Cicada / it's Brood Ten
Insect sex / predator satiation

Cicadas are **harmless!** These amazing wonders of nature will only grace us with their presence for about a month. Please be nice to them. Citizen scientists are currently mapping Brood X emergence using the Cicada Safari application. By downloading and using the app on your phone, you too, can contribute to our understanding of these incredible, long-lived insects. Thanks for listening!

-MC Bugg-Z



Spotlight On:
Chesapeake Mosquito
Control
Commission

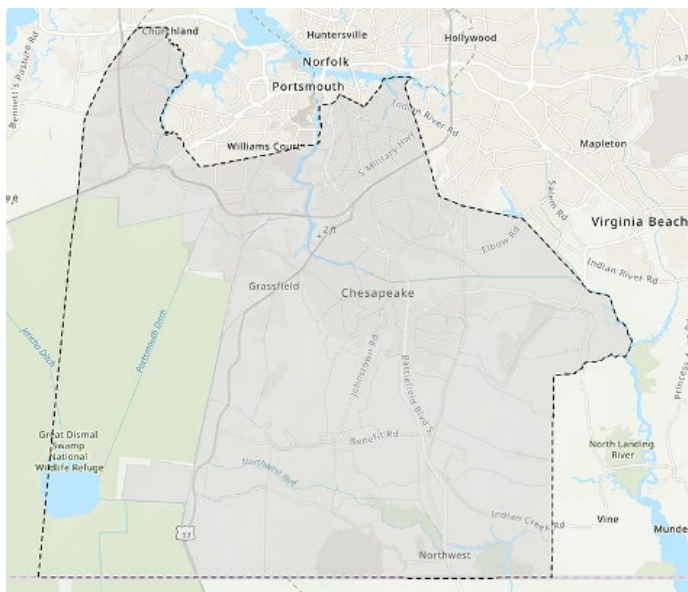


SPOTLIGHT: RESISTANCE MANAGEMENT PROGRAM AT CHESAPEAKE MOSQUITO CONTROL COMMISSION

You may feel like the topic insecticide resistance is dynamic, complex, and ever evolving. In many ways, you're right. As a vector control professional, you are challenged operationally every day to overcome resistance and successfully control mosquitoes. While this may be a new topic to some of us in vector control, it is a common theme across several entomological fields (such as agriculture and apiculture). To support you in your efforts to control mosquitoes, ADAPCO works to gather information and resources to better support your program's needs for resistance monitoring and management.

So, what do you do if you think there is insecticide resistance in your area? How do you monitor for it and respond to it when it's detected? With such an important topic, we wanted to take the opportunity to highlight programs in various regions throughout the US that have developed a resistance monitoring and management program to help them better control mosquitoes.

In the northeast region, we interviewed Lisa Wagenbrenner, Director at [Chesapeake Mosquito Control Commission \(CMCC\)](#). Lisa started off in mosquito control as a seasonal mosquito intern for the City of Virginia Beach, while finishing her degree in Biology. In 2006, she was hired as the Biologist for the City of Hampton and then in 2009 was hired as the Head Biologist for CMCC. Lisa shares, "I have been a mosquito nerd for 19 years!" From 1948 to 1965, five independent mosquito control districts were created in what is now the City of Chesapeake, Virginia. Each of the five commissions operated independently and were individually funded by special taxes levied specifically for mosquito control. In 2003, the five mosquito control commissions consolidated to become Chesapeake Mosquito Control Commission with three districts to cover the entire city.



Chesapeake's program is now responsible for 353 square miles and protects 246,000 citizens (2nd largest population in Virginia), within Southern Chesapeake, Greenbrier and Deep Creek, from the nuisance and public health threat of mosquitoes. Chesapeake has an abundance of diverse mosquito habitats, which range from urban container mosquitoes to open farmland, marshes, and the Great Dismal Swamp where pesticide usage is restricted.

"[Insecticide resistance monitoring] contributes to our efficiency, and our bottom line, and allows us to be environmentally sound without compromising service to our citizens. We can control mosquitoes and reduce the likelihood of the transmission of mosquito-borne diseases to humans and horses in the most economical responsible way."

CMCC'S APPROACH TO MONITORING AND MANAGING RESISTANCE

CMCC's Biology Department is responsible for planning, running, and record keeping of the cage field trials, bottle bioassays, and larvicide efficacy/resistance trials. Their Physical Assets Manager is responsible for upkeep of our large assortment of pesticides and guides the supervisors on the best products to use. Lisa states, "We are constantly training our field techs on all our products, the **"What, When, Where"** concept."

"We have always had a resistance management plan in place by following our philosophy of integrated pest management (IPM). Using IPM with various methods and materials accomplishes many goals:

1. It acknowledges that mosquito species differ and require different monitoring and control techniques.
2. It emphasizes source reduction- a longer term strategy and does not involve pesticides. This involves public education about artificial containers to the drainage maintenance program.
3. It increases the types of both natural and synthetic pesticides used to reduce the possibility of pesticide resistance.
4. It places priority on controlling immature stages to reduce mosquito numbers before they become adults.
5. It is the safest system for humans and the environment and has the biggest impact on the target species.
6. It saves money by making pesticide applications dependent on surveillance data, rather than on a set schedule.

Our budget has allowed for us to acquire a diverse inventory of both adulticides and larvicides giving us the ability to rotate products over the years."

When asked what changes have been observed over the years in their operations due to their resistance plan, Lisa shares, *"We have the ability to reduce problem species of mosquitoes when they arise and a better understanding of our pesticides allowing us to react quickly and plan for the future. Our larviciding program is enhanced by the knowledge acquired from our trials. We know the best product to use in any one of our many diverse mosquito habitats."*

At the beginning of their resistance program, Chesapeake relied on supplies and training from external sources (CDC, NEVBD-Cornell, various vendors), they now have a dedicated budget line for educational supplies that includes door tags and mosquito information brochures. Fifteen years ago, Chesapeake was awarded an educational grant that was instrumental in the development of their 3rd grade outreach program that is still in place today, which helps to promote source reduction.

ADULT RESISTANCE PROGRAM

CMCC prevents resistance by rotating products and monitoring efficacy by using cage field trials and bottle bioassays. Lisa shares, "Some of our early cage field trials were conducted with the assistance from our pesticide

vendors. Three years ago, the CDC began an extensive program of bottle bioassays funded by leftover funds from Zika research. The technical grade pesticides are sent free of charge along with the supplies to run bottle assays." In fact, the CDC is still providing [bottle bioassay kits free of charge](#) to anyone in the country.



LARVICIDE RESISTANCE PROGRAM

The Northeast Regional Center for Excellence in Vector-Borne Diseases- Cornell has been assisting Chesapeake's program by providing free materials for larvicide resistance testing for both (S)-methoprene & *Bti* on *Ae. albopictus* and *Cx. pipiens*. Lisa states, "Due to time constraints we have not taken advantage of this program as of yet." However, just two years ago, they designed their very own in-house larvicide efficacy/resistance program by building pools to resemble or mimic a field application (49 sq. ft and 100sq. ft).



OPERATIONAL APPLICATION OF RESISTANCE MANAGEMENT PROGRAM

With the various resistance management techniques that CMCC uses, I wanted to understand how it translates into operational use in Lisa's program. "A few years ago, we implemented cage field trials, bottle bioassays and efficacy trials with larvicides. As more information was disseminated from the CDC on pesticide resistance showing up in many parts of the country, we saw a need to add to our IPM program. We also implemented trap-spray-trap on a few occasions when we were crunched for time and needed information quickly on the effectiveness of our adulticides on specific target species. We now have a better understanding of which products are more effective. Our current adulticide inventory consists of deltamethrin, etofenprox, malathion, permethrin and resmethrin. Our rotation involves spraying the most effective product in specific areas where the target species is problematic.

We continue to gather information on our newly formed larvicide efficacy program, including how specific target species react to certain larvicides. We can adjust our output (lower or higher) depending on the species and environmental conditions. Our current larvicide inventory consists of a variety of formulations of (S)-methoprene,

Bacillus sphaericus, *Bacillus thuringiensis israelensis*, various oils and a monomolecular film. As you can see, our budget has allowed us to obtain many different products over the years. I believe this has reduced our potential for resistance build up.”

CHALLENGES TO RESISTANCE MONITORING AND ADVICE TO GET STARTED

In Lisa’s opinion, the biggest hurdle in their resistance management plan is the limitations of staff or pesticide inventory. She states, “If you don’t have enough people or a limited pesticide inventory it’s difficult to run trials and rotate products, but there are ways to accomplish a plan with determination. You must work with what you have. Just because your district is small does not mean you can’t implement all aspects of a good IPM/resistance program.”

When asked if it is beneficial for a vector control program to have a dedicated resistance management plan, Lisa shares, “Absolutely! We all share the same common goals in mosquito control: **reduce nuisance mosquitoes and control the spread of mosquito-borne diseases**. The more knowledge we can gain on the best products to use in our respective areas, the better we can control mosquitoes.”

The advice that Lisa would offer to those interested in establishing a resistance management program is, “If working with a limited budget, start off small. Take each factor of a good IPM plan and decide which one is the weakest and build on it. Reach out to neighboring mosquito control programs for advice and insight on the products they find effective or not. The base for any management program is a strong surveillance team, you can’t apply pesticides correctly or efficiently without knowing the species you are dealing with. Next, **train, train, train!** I can’t emphasize enough how important it is to have an educated field crew on the importance of applying the correct amount of pesticide and the local mosquito species. Under-applying is just as bad as over-applying and can lead to resistance in the local mosquito population. Also, educating the citizens during service calls can help reduce the ever-challenging control of container mosquitoes and the need for adulticiding at every residence.”

As you can see, there is not one simple answer when it comes to tackling and responding to insecticide resistance. Let the capabilities of your vector control program, your local mosquitoes, and the needs of your constituents drive what your insecticide resistance management plan looks like. Identifying the problem and taking small steps to combat resistance is better than no attempt at all.

~Written by Emily Boothe

Technical Development Specialist, ADAPCO

ADAPCO would like to note that the CDC is currently offering free bottle assay kits: Programs in the **continental United States and its territories** can order free Insecticide Resistance Kits by sending an email to USBottleAssayKit@cdc.gov and requesting an order form. Kits include bottles, insecticide, and manual.

ADAPCO, an Azelis company, has entomological and technical experts that will work with you to identify the appropriate solution to control nuisance and vector mosquitoes in your region. Our mission is to assist you with preserving public health. Talk to one of our experts to get started today!

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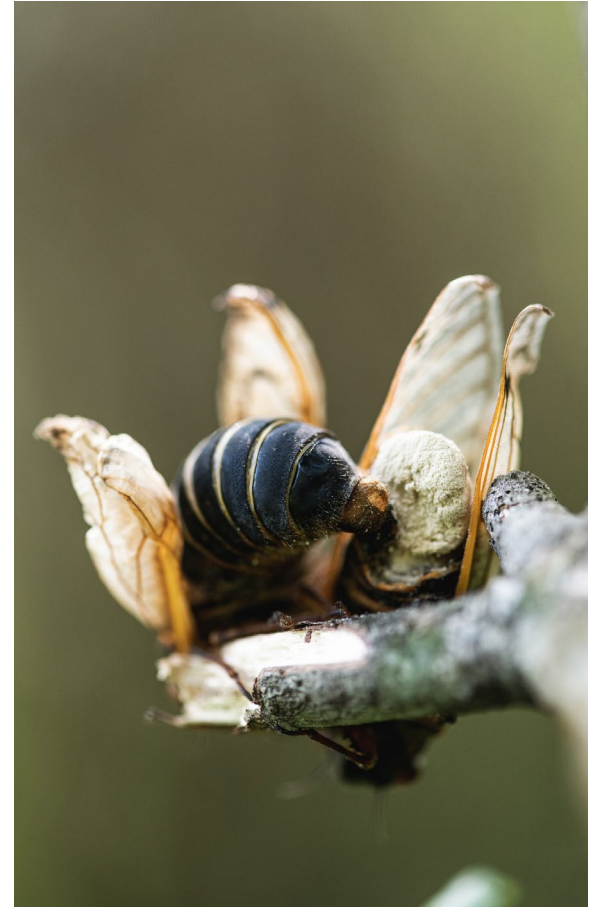
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Under-applying is just as bad as over-applying and can lead to resistance in the local mosquito population.

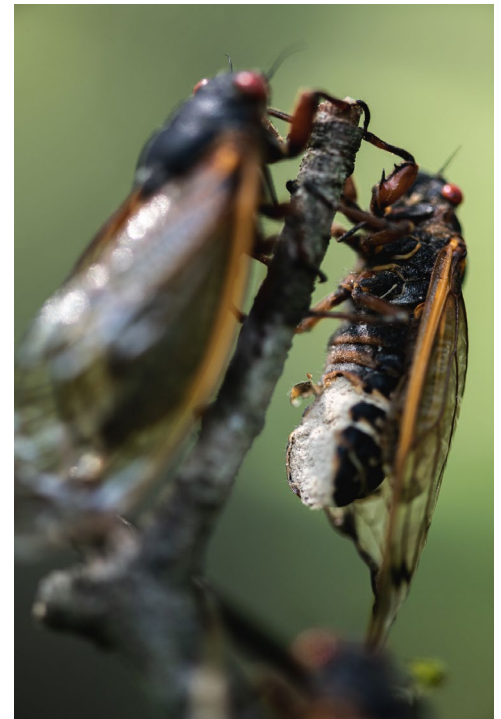
WHAT'S THAT? ANSWER

That is a periodical cicada (*Magicicada spp*) passing along an infection of the fungal pathogen *Massospora cicadina*, sometimes cheekily referred to as the “zombie butt fungus”. Districts in Northern Virginia have been treated this spring to the emergence of billions of cacophonous Brood X cicadas, a natural symphony we only get to witness once every 17 years. Around 5% of periodical cicada population ultimately winds up infected by *M. cicadina*, a fungus thought to be the only pathogen that is synchronously timed with the emergence of its host species.

Cicada nymphs initially become infected by coming into contact with *M. cicadina* spores as they dig out of the ground to molt. Eventually the infection progresses to the point that the rear segments of the abdomen fall off and leave a chalky spore producing “plug”. Though this results in infertility and absence of external genitalia, the hapless cicadas continue to seek mates and their mating behavior is altered in insidious ways by the fungus. Both males and females spend more time walking around and dragging their abdomens (and distributing spores) behind them. Males will mimic female wing flicking behavior to attract other males and will allow other courting males to mount them, wherein the fungus can be sexually transmitted. In addition, the fungus produces cathinone (an amphetamine alkaloid) which is thought to throw the cicada mating behavior even further into overdrive. These behavioral changes in concert allow the fungus to increase infection rates throughout the cicada population.



-Article and photos by Rachel Kempf, Fairfax County DCIP

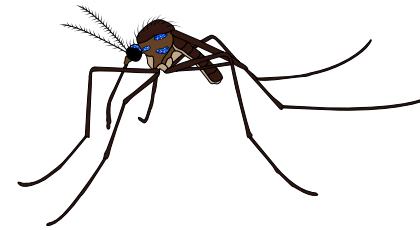


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The VMCA gratefully acknowledges the support of the following sustaining members for 2021. Without their generous contributions, much of what we do would not be possible. Please do not hesitate to contact them. They are here to help you!



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VIRGINIA MOSQUITO CONTROL JURISDICTIONS & OTHER RESOURCES

As a result of revisions to the VMCA By-Laws, the organizational member category was eliminated. In order to facilitate communication among mosquito control programs, jurisdictions with known mosquito and vector control programs are listed below. If there are other jurisdictions that should be listed, please submit them to the editor.

Virginia Mosquito Control Jurisdictions

[Alexandria Health Department](#)

Boykins, Town of

[Chesapeake Mosquito Control Commission](#)

[Chincoteague Mosquito Control](#)

[Fairfax County Health Department](#)

Fort Eustis

[Gloucester County Mosquito Control](#)

[Hampton Environmental Services](#)

[Henrico County](#)

[Newport News Vector Control](#)

[Norfolk Vector Control](#)

[Poquoson Mosquito and Drainage](#)

[Portsmouth Mosquito Control](#)

[Prince William County Mosquito & Forest Pest Management](#)

[Suffolk Mosquito Control](#)

US Air Force / Langley Air Force Base

[Virginia Beach Mosquito Control](#)

[Williamsburg Mosquito Control](#)

[York County Mosquito Control](#)

Other Mosquito Control Organizations

[American Mosquito Control Association](#)

[Mid-Atlantic Mosquito Control Association](#)

Other Resources

[Virginia Department of Health](#)

[Centers for Disease Control & Prevention](#)

[Fairfax County Education and Outreach Materials](#)

WANTED: SUBMISSIONS!

Do you have information you'd like to include in the next issue of The Skeeter or a photo you'd like to share? We are always looking for organizational updates, operational news, education and outreach activities, pictures, stories, and anything remotely vector-related to include in upcoming newsletters as well as on [Facebook](#) and [Instagram](#)

Please send all items to the Skeeter editor, Rachel Kempf at rachel.kempf@fairfaxcounty.gov

THE SKEETER
Newsletter of the
Virginia Mosquito
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*Non-voting member of the Board

Take the time to volunteer on a committee! An active membership makes for a stronger organization. Contact anyone on the Board to participate.

The Skeeter is the official production of the Virginia Mosquito Control Association. The VMCA membership is encouraged to submit articles, reviews, and any other interesting facts or tidbits for publication. Submissions can be sent to Rachel Kempf at rachel.kempf@fairfaxcounty.gov or Francis Valera at fvalera@pwcgov.org