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GMCA Newsletter

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Annual Meeting Update

Jekyll Island, 2023

We are planning to have our 2023 meeting October 18-20 on Jekyll Island at Villas by the Sea. This will be our first in-person meeting since 2019, and we hope for a big turnout and lots of interesting speakers. We are not having a meeting in 2022, as we will be having a combined meeting with the Mid-Atlantic Mosquito Control Association (MAMCA) in January of 2023 instead.

We will resume the association's long tradition of providing an educational and entertaining meeting. A wide range of mosquito-related presentations will be offered, along with a few broader entomological/public health related topics. State and local program updates, operational mosquito control issues, and timely public health related topics will be covered. Industry representatives will be in attendance to share updates on their products and services provided.

The Board of Directors of the Georgia Mosquito Control Association (GMCA) would like to invite active mosquito control personnel, researchers, and associated students who have limited financial resources to submit a letter of request for sponsorship to attend our annual meeting. This sponsorship will include two nights lodging, meals, and meeting registration.

(continued on p3)

MAMCA/GMCA Combined Meeting

Savannah, 2023

The Mid-Atlantic Mosquito Control Program (MAMCA), our regional mosquito control association with nine member states (Delaware, Georgia, Maryland, North Carolina, Pennsylvania, South Carolina, Tennessee, Virginia and West Virginia), is planning a meeting in Georgia in January of 2023. And, to avoid overlapping meeting dates, this meeting will be followed by the Fly-In, an event for aerial applicators usually put on by the Florida Mosquito Control Association (FMCA). We hope to blend the final day of the MAMCA/GMCA meeting into a set of talks relevant to all 3 groups before moving on to the Fly-In. To accommodate the aircraft brought to the Fly-In, the combined MAMCA/GMCA meeting will be held at the Chatham County Mosquito Control building, which is next to the Savannah/Hilton Head International Airport.

The meeting will take place Jan 9-13, 2023. The agenda, registration form, and hotel information are available at https://www.mamca.org/annual-conference.

Inside This Issue

We are always looking for contributors to the GMCA Newsletter, so if you have an interesting story to tell about mosquitoes or mosquito control, please send it to rosmarie.kelly@dph.ga.gov.

The New Era of Trapping

When going after mosquitoes and trying to increase the efficiency of a trapping measure in the entomological world, you must be creative. Traps exploit specific characteristics and behaviors of mosquitoes, either host seeking behaviors or potential habitat to lay eggs, or a combination of the two. In Chatham County, GA, during the summer of 2021, there was an intensive salt marsh mosquito hatch that proved to be relentless. The duration of the salt marsh mosquitoes was something that the community and mosquito control had not seen in several years, with 17,000+ mosquitoes being caught in one trap in a single night. The salt marsh reign of 2021, as the summer was dubbed, lasted ten continuous weeks. Mosquito Control discovered that ruggedized CDC light traps were not creating enough downward wind speed to keep *Aedes sollicitans* inside the trap so that they would not be pulled into the net but instead would just fly back out. So, we went off to the creativity lab and came up with the "Trash Trap".

A BG Counter was placed onto a BG Sentinel trap to help monitor the activity throughout the night, but this was not just a standard set up. We included a BG Lure, octenol, dry ice, and a black balloon. We were targeting as many sensory receptors as possible to entice the mosquitoes. The Trash Trap increased our *Ae. sollicitans* collection by 30% compared to our standard CDC light trap. We will continue to utilize the Trash Trap in the coming years as the dredge material containment area (DMCA) is our largest source of salt marsh mosquitoes, with approximately 5,600 Acres located right across the Savannah River in Jasper County, SC.

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Aedes sollicitans

Annual Meeting Update (continued from p. 1)

The purpose of this sponsorship is to encourage involvement for personnel associated with smaller programs and institutions where funding for travel and participation in professional meetings is limited.

The participant should send a one-page letter to Ms. Laura Peaty (lfpeaty@chathamcounty.org), the current president of the GMCA, requesting the sponsorship and describing how this support will enhance mosquito control or research in their program or institution. The Board of Directors of the GMCA will select the scholarship recipients. As part of this effort, the Board of Directors of the Georgia Mosquito Control Association would like to thank ADAPCO Inc. for their generous support of the GMCA's educational efforts through the years.

Vector Control Toolkit

The Vector Control Tools & Resources (VeCToR) Toolkit provides tools and resources for program improvement activities that are in line with the Centers for Disease Control & Prevention's 10 Essential Environmental Public Health Services. The Essential Services form the framework used to evaluate the effectiveness of a community's environmental public health system. The services are based on the three core functions of public health: assessment, policy development, and assurance, and provide a basis for program improvement for every area within environmental health departments.

Essential Services:

1. Monitoring
2. Diagnose and Investigate
3. Inform, Educate, Empower
4. Mobilize
5. Develop Policies and Plans
6. Enforce Laws and Regulations
7. Link and Provide Care
8. Assure a Competent Environmental Health and Vector Control Workforce
9. Evaluate
10. Research

https://www.neha.org/vector-toolkit

Is it Aedes, or is it Ochlerotatus?

Ochlerotatus had been originally established as a genus in 1891. It became an aedine subgenus in the 1930s, but in 2000 John Reinert and his colleagues elevated the subgenus *Ochlerotatus* back to a genus based upon microscopic differences in the male genitalia between it and other subgenera of *Aedes*. However, in 2005 the *Journal of Medical Entomology* and the Entomological Society of America decided to put *Ochlerotatus* back to subgenera level (http://www.entsoc.org/Pubs/Periodicals/JME/mosquito_name_policy). After a contentious worldwide debate regarding the effect the taxonomic changes would have on names established over decades of work in scientific, government and lay communities, many scientists (including those at the CDC) and others affected by the change espoused the continued use of the previously established names. So, for the time being, everything is *Aedes* again.

HOWEVER, here in Georgia, since the GDPH mosquito surveillance database was established after *Ochlerotatus* was elevated to genus status, we continue to use *Ochlerotatus* to make data access easier.

Aedes

- *Ae. aegypti*
- *Ae. albopictus*
- *Ae. cinerius*
- *Ae. vexans*

Ochlerotatus

- *Oc. atlanticus/tormentor*
- *Oc. atropalpus*
- *Oc. canadensis*
- *Oc. dupreei*
- *Oc. fulvus pallens*
- *Oc. hendersoni*
- *Oc. infirmatus*
- *Oc. japonicus*
- *Oc. mathesoni*
- *Oc. mitchellae*
- *Oc. sollicitans*
- *Oc. sticticus*
- *Oc. taeniorhynchus*
- *Oc. thibaulti*
- *Oc. triseriatus*
- *Oc. trivittatus*

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GMCA Newsletter Supplement

Volume 13, Issue 2s

The Asian bush mosquito, *Aedes japonicus japonicus*, in Chatham County, Georgia

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The Asian bush mosquito, *Aedes japonicus* (Figure 1), is native to areas in the Far East, including Japan, Korea, and associated islands in the Asia-Pacific region (Tanaka et al., 1979). It is a fairly recent introduced species of mosquito to North America. Peyton et al. (1999) first reported adults of this species in the United States from New York and New Jersey in 1998. These original collections were made in CDC light traps and New Jersey light traps. Soon after, Andreadis et al. (2001) documented this species from numerous locations in Connecticut. They reported two specimens collected during 1998, one aspirated from a linen sheet illuminated by a UV light at dusk, and another which was attracted to human bait in late afternoon. These specimens were found in July and October, respectively.

Since these initial reports the species has expanded its range throughout the continental United States to include Maryland (Sardelis and Turell, 2001), Pennsylvania and Ohio (Fonseca et al., 2001), Virginia (Harrison et al., 2002), Georgia and South Carolina (Reeves and Korecki, 2004), West Virginia (Joy, 2004), Indiana (Young et al., 2004), Washington (Roppo et al., 2004), North Carolina (Gray et al., 2005), Alabama (Mullen, 2005; see Qualls and Mullen, 2006), Missouri (Gallitano et al., 2005), Kentucky (Saenz et al., 2006), New Hampshire and Massachusetts (Stull et al., 2006), Illinois (Morris et al., 2007), Oregon (Irish and Pierce, 2008), Iowa (Dunphy et al., 2009), Arkansas (Gaspar et al., 2012), Mississippi (Thorn et al., 2012), Tennessee (Haddow et al., 2009), and Florida (Riles et al., 2017). It has also become established outside the United States mainland in Hawaii (Larish and Savage, 2005), Canada (Thielman and Hunter, 2006), and Europe (Schaffner et al., 2009; Versteirt et al., 2009).

Peyton et al. (1999) hypothesized that this species may have been unintentionally introduced into this country through the importation of used tires from its native homeland. The importation of used tires has long been recognized as a potentially high risk means for stowaway mosquito species to gain entry to new areas (Pratt et al., 1946) and is considered a likely method of the introduction for species such as *Aedes albopictus* into the United States (Eads, 1972). In support of this thought, Andreadis et al. (2001) found *Aedes japonicus* larvae in eight of nine waste tire disposal sites during the early stages of this species expansion in the United States.

Analysis of specimens from the northeastern portions of the United States indicated there has been at least two genetically independent foci of expansion of this species in this country (Fonseca et al., 2001). They found evidence of significant genetic differences between members from the populations in New York, New Jersey, and Connecticut and those from Pennsylvania and Maryland. They also suggested a different mode of dispersal for preexisting colonies within the United States linked to the Standardbred horse trade, where adult mosquitoes resting in horse trailers could be transported to new locations along the racing circuit, and then to other participating stables.

In its native surroundings, larvae occur in a wide variety of natural and artificial containers, usually favoring shaded places and water containing rich organic matter, but often inhabit rock-hole environments. Adults live in forested areas and are daytime biters, but appear reluctant to bite humans (Tanaka et al., 1979). Miyagi (1971) listed cemetery basins, stream rock pools, bamboo cuts, tree-holes, and artificial containers as larval habitat. He also indicated that adults do not commonly feed on humans but are attracted to dry ice. He further suggested this species overwinters in the egg stage since young larvae are commonly found in granite cemetery basins in early spring.

Adult *Ae. japonicus* have been collected through the use of a number of methods. Aspirating adults around human bait (Scott, 2003) or resting sites; grass or hay infusion-baited gravid traps (Scott et al., 2001) or a fermented mixture of water and rabbit food (Falco et al., 2002); CDC light trap baited with dry ice or various lures (Falco et al., 2002; Anderson et al., 2012); BG Sentinel tarps baited with BG lure® (Anderson et al., 2012). In eastern Tennessee, Haddow et al. (2009) captured the bulk (99%) of *Aedes japonicus* in their study from CO_2 -baited CDC light traps with lights removed. One specimen was also taken during a series of human-landing catches conducted along with this work. In the Florida Panhandle, adult mosquitoes were taken with a variety of adult trapping methods, including Mosquito Magnet® X trap; CDC UV updraft light trap; and CDC gravid trap deployed in sparsely populated rural forests, forested urban areas, and both suburban and urban peridomestic areas (Riles et al., 2017).

Scott (2003) examined a number of biological and ecological aspects of this species in New Jersey. She found that ovipositional activity began during the twilight period of the evening and peaked between 2200 and 0100 hours. A second smaller peak occurred just before sunrise, between 0400-0500 hours. She also reported that temperature was inversely related to the developmental period in larvae reared between 10°C and 28°C; at 34°C development slowed, and no larvae survived to emergence at 34°C or 40°C. The average larval period varied from 141 days at 10°C to 17 days at 28°C. Harris (2014) indicated that numbers of adult female *Aedes japonicus* were significantly lower in disturbed forest areas that had been logged recently (0-2 years) or less recently (12-14 years) than areas that had no history of logging for at least the last 80 years in southwestern Virginia.

In Georgia, Reeves and Korecki (2004) collected immature forms of *Ae. japonicus* from rock pools lined with leaves in Rabun County. At these locations, *Aedes japonicus* was found in association with *Aedes atropalpus* larvae. Gray et al. (2005) recorded larvae from rock holes, used tires, and a bucket. Larvae were found with *Anopheles punctipennis* and *Culex territans* at one site; and with *Aedes albopictus* at two other sites. In New Jersey, Scott (2003) found larvae with and without other species of mosquitoes, and mentioned that when cohabiting with other species, it was often the more common species present. She listed *Aedes albopictus*, *Ae. atropalpus*, *Ae. hendersoni*, *Ae. triseriatus*, *Anopheles barberi*, *An. punctipennis*, *An. quadrimaculatus*, *Culex pipiens*, *Cx. restuans*, *Cx. salinarius*, *Cx. territans*, *Culiseta melanura*, *Orthopodomyia signifera*, and *Toxorhynchites rutilus septentrionalis* as species found with *Ae. japonicus*. Bivens (2007) indicated that in the southern Appalachian region, *Ae. japonicus* was most often found with *Cx. restuans* in artificial container habitats, while *Cx. territans* was the most likely associated species in natural settings, specifically rock pools.

Blood preference in this species appears to lean heavily towards mammals. Feng (1938) indicated that this species will bite humans but appears to prefer other animals. Tanaka et al (1979) said that this species is a daytime feeder that is reluctant to bite man. This reluctance apparently has carried over to the United States, as Haddow et al. (2009) recorded only a single specimen collected during a series of human-landing catches in eastern Tennessee, which comprised just 0.19% of all mosquito species attracted. Miyagi (1972) reported they readily feed on chicks and mice (but not reptiles or amphibians) under laboratory conditions. However, Sawabe et al. (2010) reported only mammalian blood in the limited number of *Aedes japonicus* (3) examined from its native Japan. Likewise, Molaei et al. (2008) also found only mammalian blood (deer, human, and chipmunk) in blood-fed mosquitoes from Connecticut. Later, Molaei et al. (2009) reported more than half the blood-fed specimens they analyzed contained white-tailed deer blood (52.8%), followed by human contributions (36.1%). Fallow deer (from a nearby captive wildlife facility), horse, and Virginia opossum accounted for the remaining identified blood meals.

Natural predators of *Aedes japonicus* are poorly recognized. Undoubtedly fish may represent an ideal predator for many mosquito species while in their larval stages, particularly if rock pool habitat known to be used by this species becomes flooded by nearby streams. On the other hand, for individuals utilizing tree hole or container habitat as larval habitat, fish are probably not a major agent of control. In such environments, larvae of mosquitoes in the *Toxorhynchites* group may cause significant mortality in this species, as Freed et al. (2014) found that the presence of *Tx. rutilus* had a strong negative impact on survivorship of both *Ae. japonicus* and *Ae. triseriatus* in laboratory tests.

Reeves and Korecki (2004) postulated that this species could be involved in the transmission of pathogens like West Nile virus or dog heartworms. West Nile virus has been detected in this species from New York (White et al., 2001; Bernard et al., 2001; Kulasekera et al. 2001; DeCarlo et al., 2020) and New Jersey (Scott, 2003). In addition, eastern equine encephalitis (EEE) has been isolated from this species in Massachusetts (Stull et al., 2006); Cache Valley virus from Virginia (Yang et al., 2018); and La Crosse virus from Virginia and West Virginia (Harris et al., 2015) and Tennessee (Westby et al., 2015).

It would seem that a species adapted to colder environments, such as *Aedes japonicus* (Tanaka et al., 1979) would be an unlikely candidate for introduction to the humid subtropical climate found throughout Georgia, much less the coastal regions of the state. However, a female *Aedes japonicus* was collected in a gravid trap in Chatham County on June 13, 2018. The specimen was in very good condition and was considered a freshly emerged adult. This trap also contained four *Ae. albopictus* and 108 *Culex quinquefasciatus*. No additional records of this species were found in the county since this initial discovery until 2022 when an adult female was captured in a gravid trap located in the Port Wentworth area on the night of May 19. Along with this specimen, one male *Aedes albopictus*; 16 male and 120 female *Culex quinquefasciatus* were also caught. These sites are situated in more or less rural or semirural locations nearly six miles apart along the Savannah River corridor (Figure 2) and lie in close proximity to loading/off-loading work associated with a very active port.

The 2018 site is located on Hutchinson Island within the wooded perimeter of a area dominated by Chinese tallow trees (*Triadica sebifera*). Curiously, this site is basically the same location where *Aedes albopictus* was first encountered in Chatham County during the mid 1980's. The more recent collection site is situated at a lift station occurring along the edge of an older subdivision built mostly during the 1940's. A thin patch (ca 35-50 m wide) of mixed forest that includes sweetgum (*Liquidambar styraciflua*), Chinese tallow tree (*Triadica sebifera*), oaks (*Quercus* ssp.), magnolia (*Magnolia grandiflora*), and pine (*Pinus taeda*) buffer the subdivision from a nearby paper mill.

Considering no larval forms of *Aedes japonicus* have been collected by our staff, it is easy to presume that its introduction to the Chatham County region is related to the heavy container ship traffic of the local port, especially considering that both locations where this species have been found are very close to bustling port activities. However, Gray et al. (2005) suggested two other possible mechanisms of introduction, both of which were based primarily upon artificial containers. The first mechanism is the dispersal of containers along major highway systems by humans, while the second involves rock holes and containers situated along river systems where periodical flooding may wash eggs long distances downstream. Interstate 16 originates in Chatham County, and not only is involved with the distribution of imported materials from our ports, but also the delivery of a wide variety of exports to the area from the central regions of the state and beyond. Additionally, Interstate 95 is a major corridor running north and south along the eastern coast of the US. The county also is bordered by the Savannah River to the east which forms from the Tugaloo and Chattooga rivers and drains the southeastern side of the Appalachian Mountains, and the Ogeechee River to the west which originates in the southeastern edge of the Piedmont Province. Thus, these rivers could serve as arteries that carry eggs of this species from sites located well upstream.

Figure 1. Adult *Aedes japonicus*.

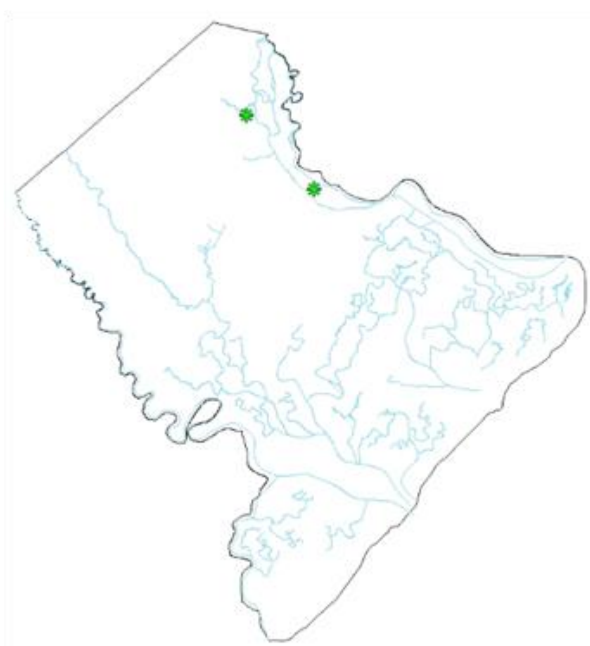

Figure 2. *Aedes japonicus* locations in Chatham County.

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