Journal of the American Mosquito Control Association, 39(2):129–133, 2023

SCIENTIFIC NOTE

COUNTY RECORDS FOR *AEDES JAPONICUS* IN GEORGIA

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ABSTRACT. Consolidating and updating distributional data for mosquito species within a state is a good practice. These updates have an immediate impact by providing documented species distribution information for public use and by serving as a resource to researchers who need background information about a species's state distribution. In Georgia, *Aedes japonicus*, an introduced species, was peer review reported from 7 counties (2002–06): Fulton, Habersham, Lumpkin, Rabun, Towns, Union, and White. No further records were found in peer-reviewed journals or in the Symbiota Collections of Arthropods Network. This study consolidated the 7 peer-reviewed county records for *Ae. japonicus* with 73 new county records from surveillance data collected by the Georgia Department of Public Health. This study documented the presence of *Ae. japonicus* in 80 of the 159 counties in Georgia.

KEY WORDS Culicidae, distribution, mosquito, new records, surveillance

Aedes japonicus (Theobald) is a rock hole and container-inhabiting mosquito that was first documented in the USA in 1998 in collections conducted in Connecticut, New Jersey, and New York by Munstermann and Adreadis (1999) and Peyton et al. (1999). This species is cold tolerant and is among the first mosquito species to be collected in Georgia each year (Georgia Department of Public Health [GDPH] mosquito surveillance database). *Aedes japonicus* is not considered an important disease vector in its native range (Ibañez-Justicia et al. 2018). However, this species has been found positive for West Nile virus (WNV) in the field and is competent to transmit WNV, LaCrosse encephalitis virus (LAC), eastern equine encephalitis virus (EEE), and other arboviruses in the laboratory (Takashima and Rosen 1989; Sardelis et al. 2002a, 2002b, 2003; Turell et al. 2005).

Fielden et al. (2015) reported the spread of this species to Ontario and all eastern provinces in Canada. In the USA, *Ae. japonicus* spread west to the midwestern states of South Dakota, Nebraska, Kansas, Oklahoma, and Texas (Bradt et al. 2018, Vicent et al. 2020, Rogers et al. 2021, Sames et al. 2022). Using spatial modeling based on climatic variables, Peach et al. (2019) predicted this line of states to be the western limits of the species in the USA. Peach et al. (2019) also discussed the isolated populations of *Ae. japonicus* in the Pacific Northwest, which Roppo et al. (2004) reported in Washington state, and later it was found in Oregon and British Columbia (Irish and Pierce 2008, Jackson et al. 2016).

On June 30, 2002, *Ae. japonicus* was collected in Fulton County for the first record of this species in Georgia (Gray et al. 2005). Additional collections of *Ae. japonicus* were made in 2003–04 in Fulton, Lumpkin, Rabun, Towns, Union, and White counties (Reeves and Korecki 2004, Gray et al. 2005). Later Bevins (2007) reported *Ae. japonicus* collections in Rabun and Habersham counties, and Day et al. (2021) reported additional *Ae. japonicus* collections in Rabun County. No further records were found in peer-reviewed journals or in the Symbiota Collections of Arthropods Network, which searches university and other curated insect collections for specimen data.

In 2002 in response to the threat of West Nile virus, the GDPH hired a public health entomologist to conduct mosquito surveillance and to collaborate with jurisdictions conducting surveillance. Since then the GDPH has collected data on the distribution of *Ae. japonicus* and other mosquitoes in Georgia, with the objective of this report being to present the *Ae. japonicus* distributional data obtained through GDPH surveillance.

The GDPH surveillance activities were conducted as part of their official duties in assisting, training, and advising county/municipal programs, and for specific purposes such as determining the status of arbovirus vectors. Surveillance was conducted throughout Georgia between 2002 and 2022 and has involved multiple collaborators. Collaborators included public health districts, county or municipal mosquito control programs, contractors, and 5 regional vector surveillance coordinators (VSCs). While the VSC program was in existence (2016–20), the GDPH was able to collect mosquito surveillance data from all of Georgia's 159 counties (Nguyen et al. 2020). The Centers for Disease Control and

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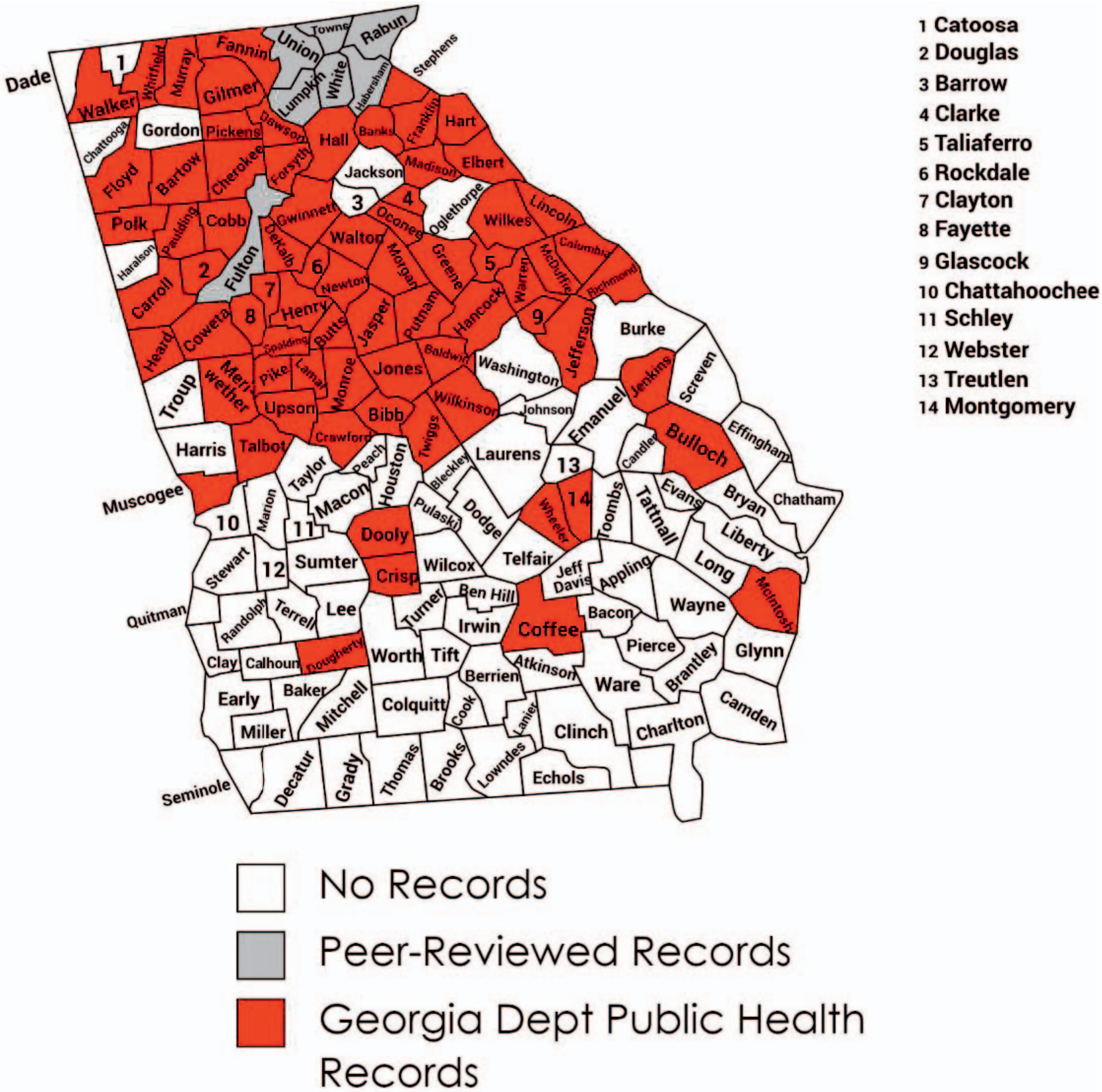

Fig. 1. Georgia counties with records of *Aedes japonicus*.

Prevention light traps, BioGents Sentinel traps, and gravid traps were used to collect samples during this study. In addition, 21 *Ae. japonicus* larvae were collected from tires in Washington County in April 2019 during routine surveillance and reported to GDPH. A single larva was collected in 2021 in Richmond County during specimen collection for pesticide resistance testing and reported to the GDPH. It was found in November in a tire that was holding water. Typically, larval surveillance data are not reported to the GDPH.

Between 2002 and 2022, the GDPH and collaborators collected *Ae. japonicus* in 80 counties (Table 1 and Fig. 1). Seven of these counties had been previously reported (Gray et al. 2004, Reeves and Korecki 2004, Bevins 2007), and the data in Table 1 acknowledge those records. Not all data from collaborators are shared with the GDPH, so these records may underestimate the number of counties with a presence of *Ae. japonicus*. A total of 2,522 *Ae. japonicus* have been collected since 2003, with $<1\%$ collected from BGS traps (with lure), 28.75% collected in CDC light traps (with dry ice), and 70.66% collected in gravid traps (with hay infusion). In fewer than 1%, the trap type was not captured. The number of *Ae. japonicus* specimens collected per county was small, with only 15 counties having over 10 specimens collected during this study. Specimen numbers ranged from 1 to 178 with an average of 11.088 and a median of 3.

A county-level resolution is useful in that it is a subsection of a state and allows a rough refinement of

Table 1. County records for *Aedes japonicus* in 80 of the 159 Georgia counties by county, collector, and collection date.

County	No. specimens	Collector	Collection date
Baldwin	1	GDPH	June 2021
Banks	5	GDPH	September 2017; May 2018; June 2019; May 2020; April 2021
Bartow	1	GDPH	June 2017
Bibb	5	GDPH	October, November 2017; April 2019; May 2020
Bulloch	2	GDPH	February, July 2019
Butts	8	GDPH	July, August 2017; May 2019; June 2021
Carroll	1	GDPH	September 2020
Cherokee	4	GDPH	July, September 2016; June, August 2017
Clarke	50	GDPH	May, June, August, October 2018; April–October 2019; June 2022
Clayton	51	GDPH	July, October 2006; July, August, September 2007; July, September 2008; July, August 2009; July, September 2010; July, August, October 2011; July, September 2016; July 2017; July 2019
Cobb	104	GDPH	August, October 2004; July–October 2005; August–October 2006; July 2007; July–October 2008; July, October 2009; July, October 2010; July–September 2011; July 2013; August, September 2017; May, July 2018; June 2021
Coffee	1	GDPH	July 2018
Columbia	2	GDPH	August 2009; June 2018
Coweta	3	GDPH	June 2018
Crawford	1	GDPH	June 2021
Crisp	1	GDPH	October 2017
Dawson	14	GDPH	October 2017; September 2022
DeKalb	178	GDPH	June–October 2004; July–October 2005; July, August 2006; September, October 2007; July, August, October 2008; June–October 2009; May, July–September 2010; June, July, August 2011; August, September 2012; July, September, October 2013; June, August 2016; June, July 2017; July, September, October 2018; July–October 2020
Dooly	1	GDPH	October 2017
Dougherty	1	GDPH	July 2011
Douglas	8	GDPH	August, September 2005; July 2017; July 2018
Elbert	1	GDPH	July 2019
Fannin	5	GDPH	June 2017; August 2019; July 2021
Fayette	4	GDPH	August 2016; May 2019
Floyd	3	GDPH	July 2009; September 2016; June 2017
Forsyth	4	GDPH	August 2017; June 2018; May 2019; August 2020
Franklin	9	GDPH	May 2018; May 2019; June 2020; April 2021; July, August 2022
Fulton	64	Gray et al. (2005); GDPH	June 2002; June, July 2003; September 2004; July, October 2006; July, October 2007; September–November 2008; July, September, October 2009; June–October 2010; July 2013; July 2014; July 2015; June, September, October 2016; June–July 2017; May, June, August 2018; May 2019; August–October 2020
Gilmer	2	GDPH	September 2016; August 2017
Glascock	2	GDPH	July 2021
Greene	2	GDPH	July 2014; August 2018
Gwinnett	8	GDPH	July 2011; June 2012; September 2016; June, September 2019; July 2020
Habersham	12	Bevins (2007); GDPH	July 2005; June 2017; June–July 2021
Hall	20	GDPH	June–July 2017; May 2018; June, August, September 2019; May, July 2020; July 2022
Hancock	2	GDPH	October 2017; May 2021
Hart	6	GDPH	August 2017; July 2018; June 2020; May 2021
Heard	5	GDPH	October 2008; October 2017; September 2020; June 2021
Henry	17	GDPH	July, September 2007; July, August 2009; July, September 2010; July 2011; June 2012; May 2016; June 2018
Jasper	1	GDPH	April 2021
Jefferson	6	GDPH	May 2021; July 2022
Jenkins	2	GDPH	May 2018; June 2021
Jones	1	GDPH	May 2019
Lamar	4	GDPH	September 2017; May 2019; June 2021; October 2022
Lincoln	1	GDPH	July 2021
Lumpkin	8	Gray et al. (2005); GDPH	2003; June 2004; July 2018; August 2019; July, September 2020; July 2021

Table 1. Continued.

County	No. specimens	Collector	Collection date
Madison	1	GDPH	May 2019
McDuffie	2	GDPH	June 2018; April 2019
McIntosh	1	GDPH	August 2011
Meriwether	1	GDPH	July 2010
Monroe	1	GDPH	June 2021
Montgomery	1	GDPH	September 2017
Morgan	2	GDPH	May, July 2019
Murray	46	GDPH	May 2017; April, May, August, October 2018; April–June, August, September 2019; June–August 2020; June 2021
Muscogee	11	GDPH	August, October 2009; July, August 2010; July 2014; August–September 2022
Newton	21	GDPH	July 2013; September 2017; June 2019; October 2021; June–July 2022
Oconee	3	GDPH	May 2015; May, July 2019
Paulding	2	GDPH	July 2017; August 2018
Pickens	2	GDPH	July 2016; August 2019
Pike	5	GDPH	October 2017; September 2018; June 2019
Polk	2	GDPH	June 2016
Putnam	1	GDPH	May 2021
Rabun	14	Reeves and Korecki (2004); GDPH	July 2003; August 2017; June 2018; September 2019; July–September 2020; June 2021; September 2022
Richmond	71	District 6 EH	April, June, July, October, November 2017; April 2018; April, September 2019; April–June, August September, November 2020; March–September, November 2021; June, August 2022
Rockdale	2	GDPH	June 2019; July 2021
Spalding	4	GDPH	May 2019; August 2021
Stephens	5	GDPH	August 2017; July 2019; September 2020; July 2021
Talbot	2	GDPH	July 2015; July 2019
Taliaferro	5	GDPH	June 2018; June 2020; July 2021
Towns	4	Gray et al. (2005); GDPH	2003; July 2017; August 2020; June 2021
Twiggs	1	GDPH	June 2021
Union	3	Gray et al. (2005); GDPH	March 2004; July 2017; June 2021
Upson	3	GDPH	September 2017; May 2019
Walker	2	GDPH	June 2016
Walton	3	GDPH	July 2016; September 2019
Warren	1	GDPH	June 2021
Wheeler	1	GDPH	August 2021
White	5	Gray et al. (2005); GDPH	2003; June 2004; August 2019; June 2020
Whitfield	22	GDPH	September 2016; July, September 2017; August 2018; May, June 2019; July 2020; May–June 2017; May 2022
Wilkes	6	GDPH	April 2018; June 2021
Wilkinson	1	GDPH	June 2021

a species distribution. Peer-reviewed articles, which experimented with wild-caught mosquitoes or which were reporting surveillance results, normally listed the county, a specific or range of dates, and an approximate location of the collection site. Data from these articles can be extracted and used as evidence of a county-level presence for a mosquito species or can be tested through additional surveillance.

In Georgia, *Ae. japonicus* has been detected as early as February, and it has been detected as late as November in multiple years. Peak numbers were reported in July, with the most active period being May through September. When *Ae. japonicus* were first detected at a site, their numbers were typically low, and it would take a few years before their numbers increased. Bruce Harrison (personal communication, 2012) indicated that when there were low levels of *Ae. japonicus*, they did not appear to be attracted to humans, but as their population increased, they were more likely to become human biters. Molaei et al. (2009) found that *Ae. japonicus* fed exclusively on mammalian blood, including the blood of humans. Laboratory studies have shown that *Ae. japonicus* is a competent vector of WNV and a moderately effective vector for LAC and EEE (Sardelis and Turell 2001). Because of limited funding, only 38% of *Ae. japonicus* collected by the GDPH between 2001 and 2022 were tested for arboviruses, and all tested negative. However, WNV-positive *Ae. japonicus* have been found in other states

(CDC 2009), implicating this species as a bridge vector to humans and horses. While there is potential for *Ae. japonicus* to become a vector and/or a pest species, more studies are needed to understand its ecology and population dynamics in Georgia.

The authors sincerely thank the collaborators who assisted in collecting these data. These collaborators included the Georgia Environmental Health Specialists, Richmond County Mosquito Control, Chatham County Mosquito Control, Hinesville Mosquito Control, Valdosta State University, GDPH vector surveillance coordinators, mosquito control contractors (Clarke, Bug Busters, Mosquito Control Services), and many others.

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