Culex coronator in coastal Georgia and South Carolina

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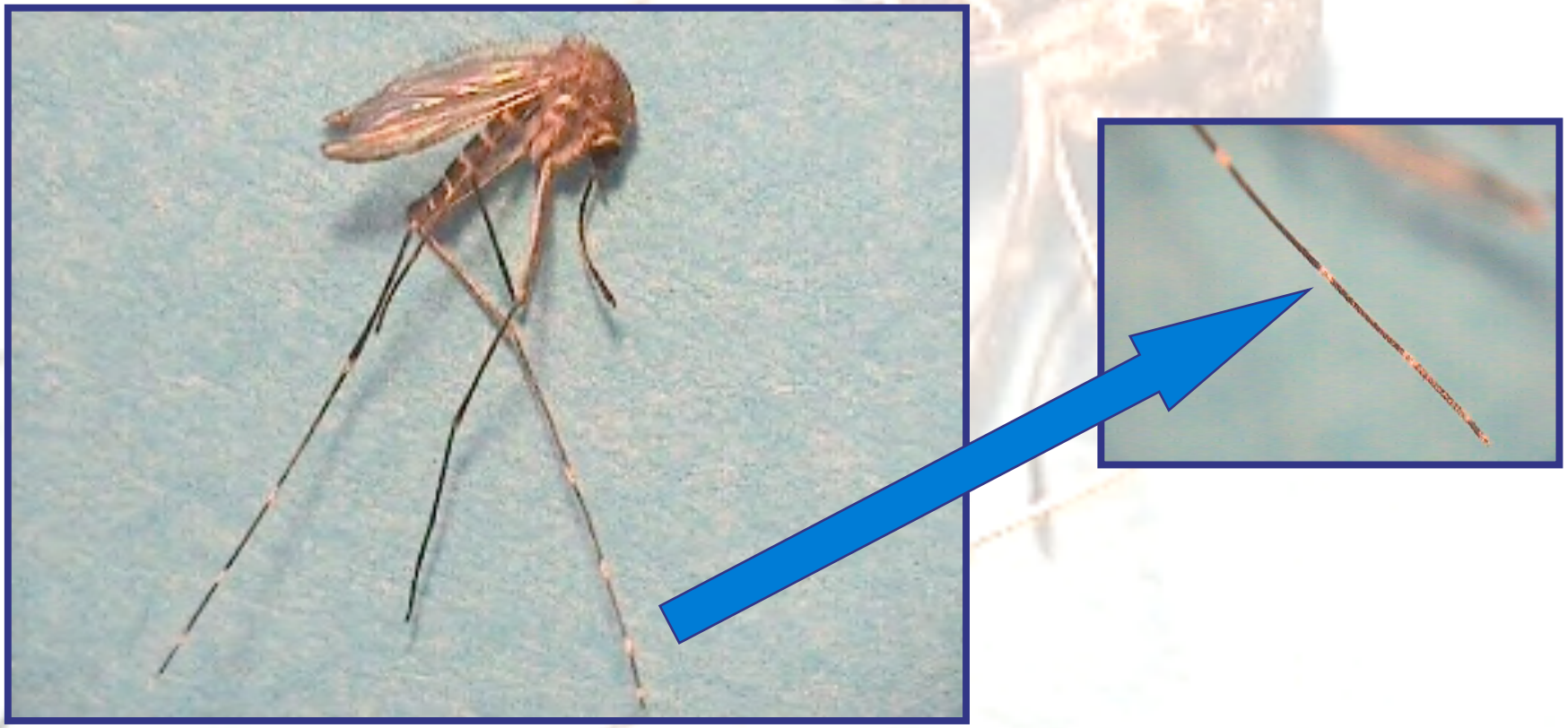
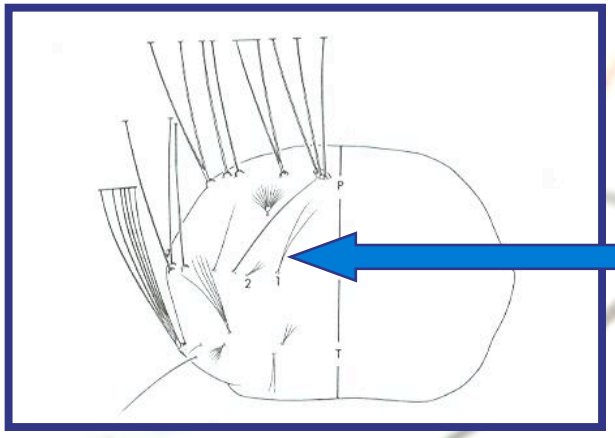
Adult *Culex coronator* look similar to *Culex quinquefasciatus* in general coloration and body pattern. However, *Culex coronator* possesses banded legs, unlike any other *Culex* species found in our area. Adult *Culex coronator* also differs from *Culex quinquefasciatus* in having darker scales on the abdomen (black compared to brown), abdominal dorsal pattern composed of white rather than cream scales, and no pale scales on the palpi.

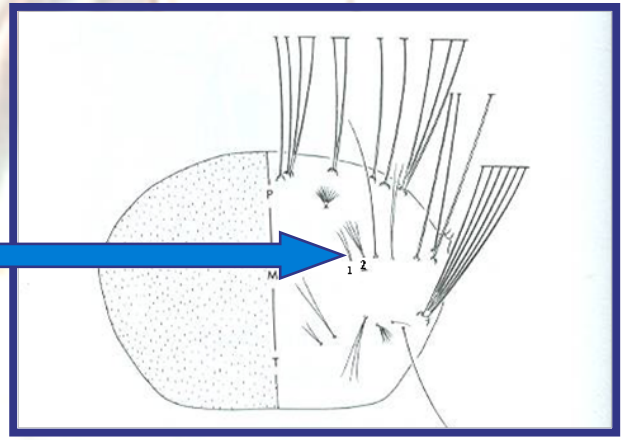


Larval *Culex coronator* have fairly long siphon tubes and look similar to other *Culex* species found in our area, such as *Culex salinarius*, *Culex nigripalpus*, and *Culex restuans*. In both *Culex salinarius* and *Culex restuans* the 1-M seta are much longer than the 2-M, whereas these seta nearly equal in size on *Culex coronator* and *Culex nigripalpus*.

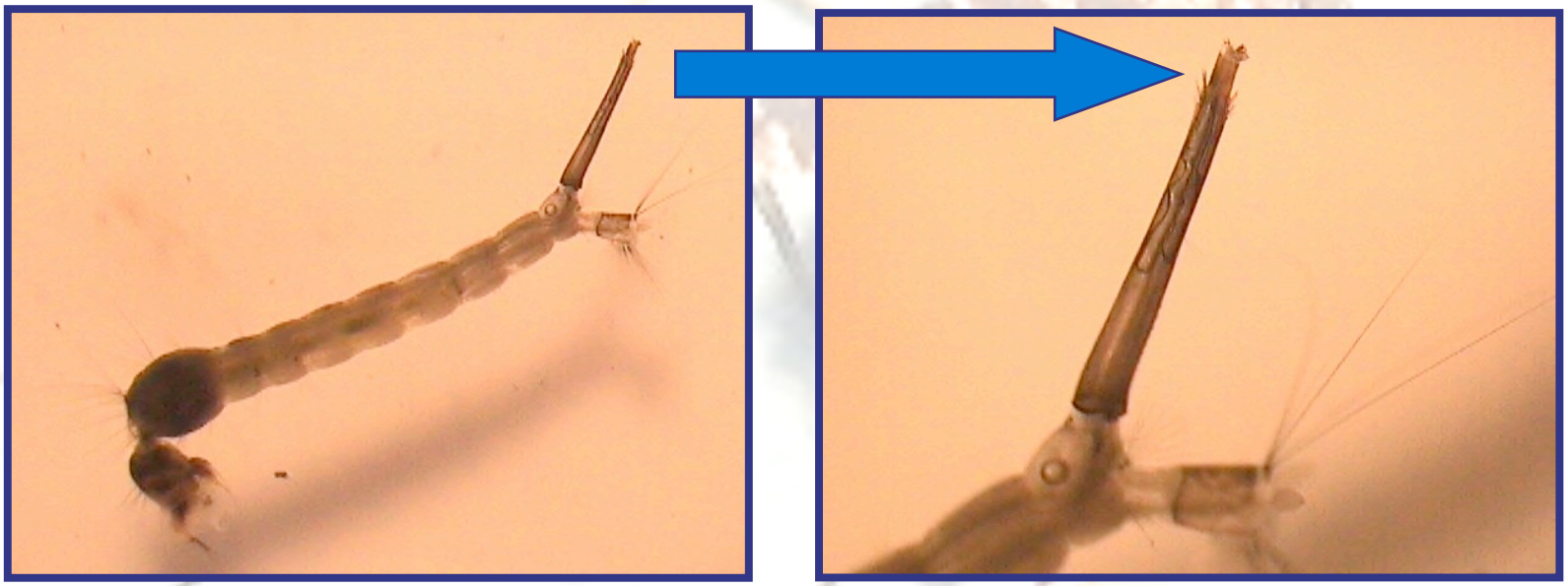


Culex salinarius* and *Culex restuans

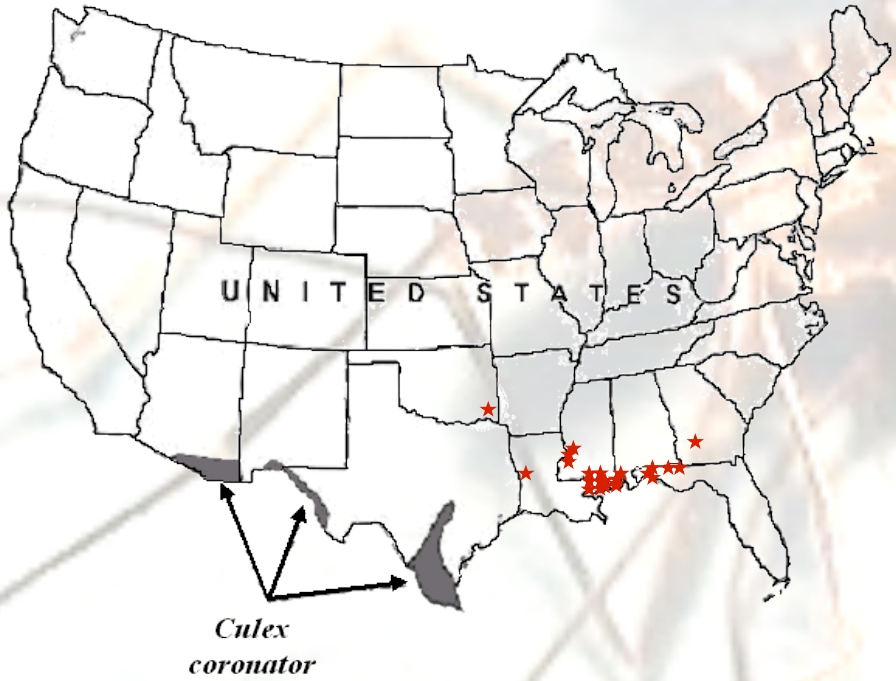
Culex coronator* and *Culex nigripalpus



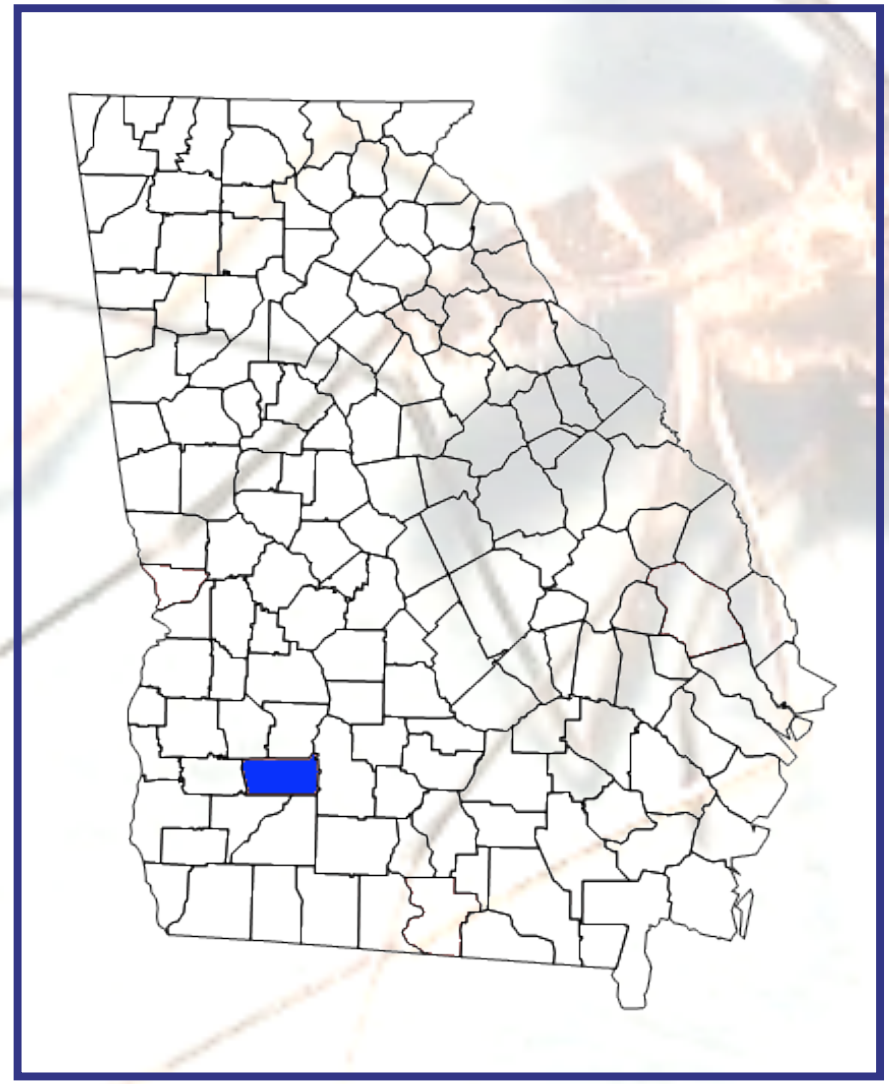
Although *Culex coronator* larvae have long siphon tubes like *Culex salinarius*, *Culex nigripalpus*, and *Culex restuans*, a closer examination reveals several characteristic spines near the apex of the siphon.



Known range as reported in the literature of *Culex coronator* for the United States. Shaded area from Darsie and Ward (2005), stars indicate more recent records from Bradley (2004), Debboun et al. (2005); Varnado et al. (2005), Goddard et al. (2006), Smith et al., (2006), and McNelly et al. (2007).



Recently *Culex coronator* has been found in four Georgia counties. Kelly (2006), noted the first Georgia records from Dougherty County, and later Kelly et al. (2008) expanded the range to include Muscogee and Lowndes counties. It has also been collected in Bulloch County as well (Kelly, pers. comm.).



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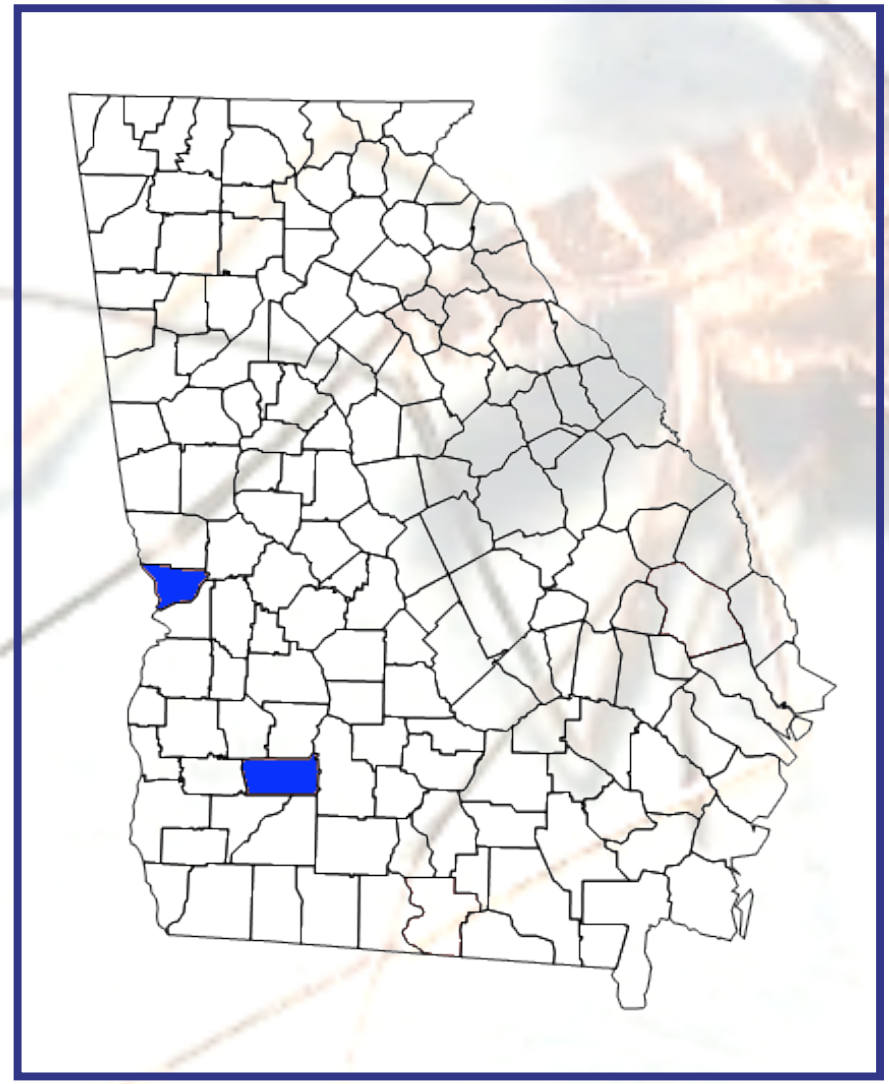

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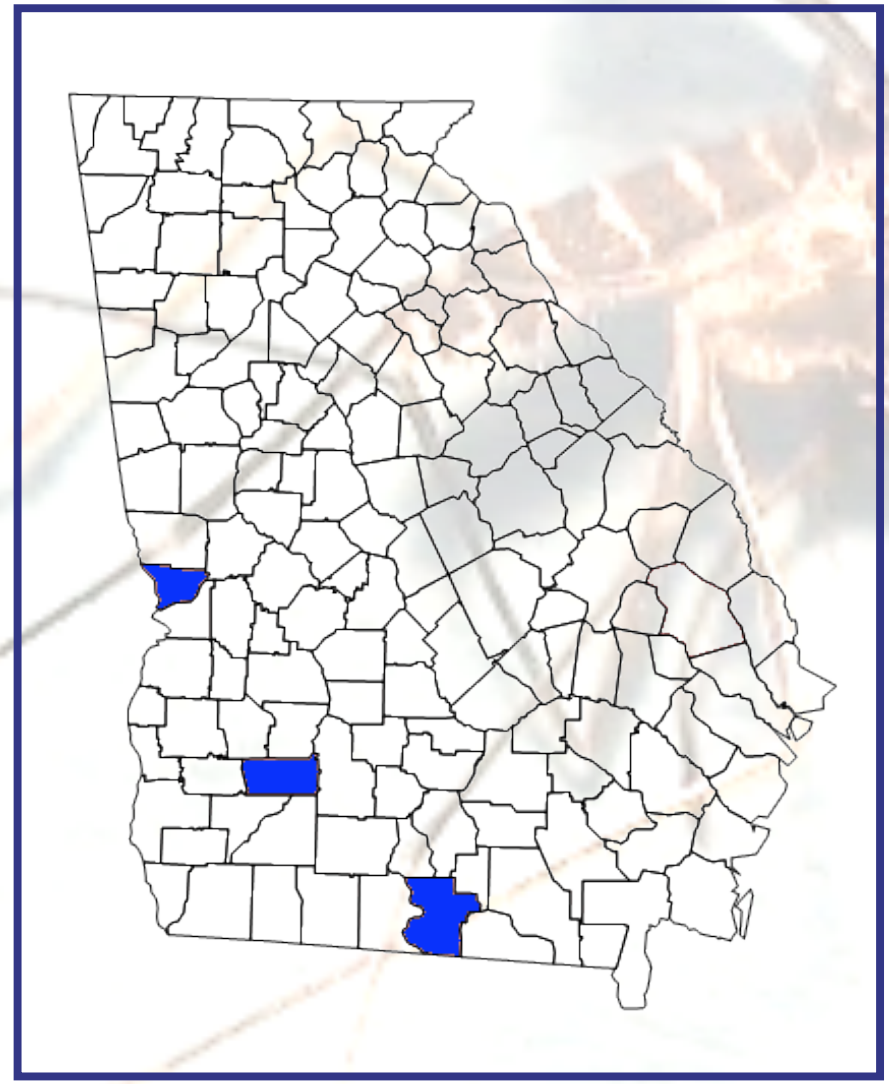

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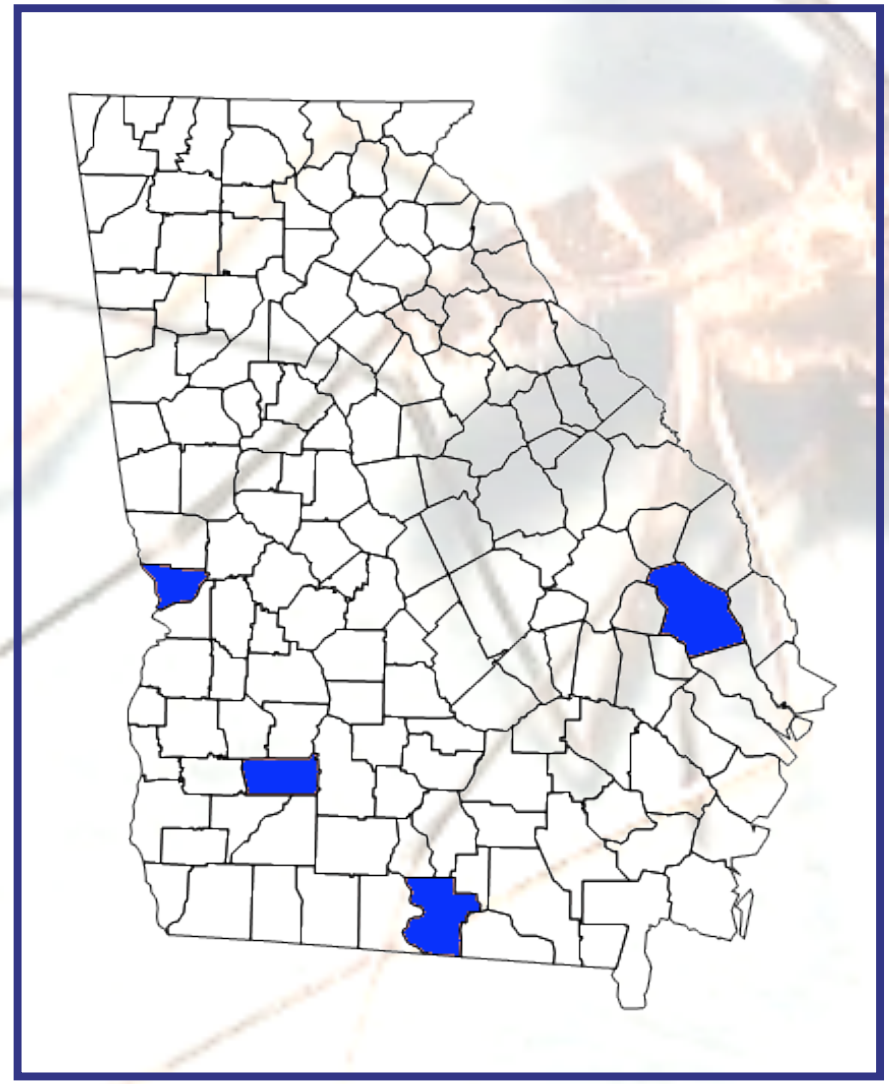
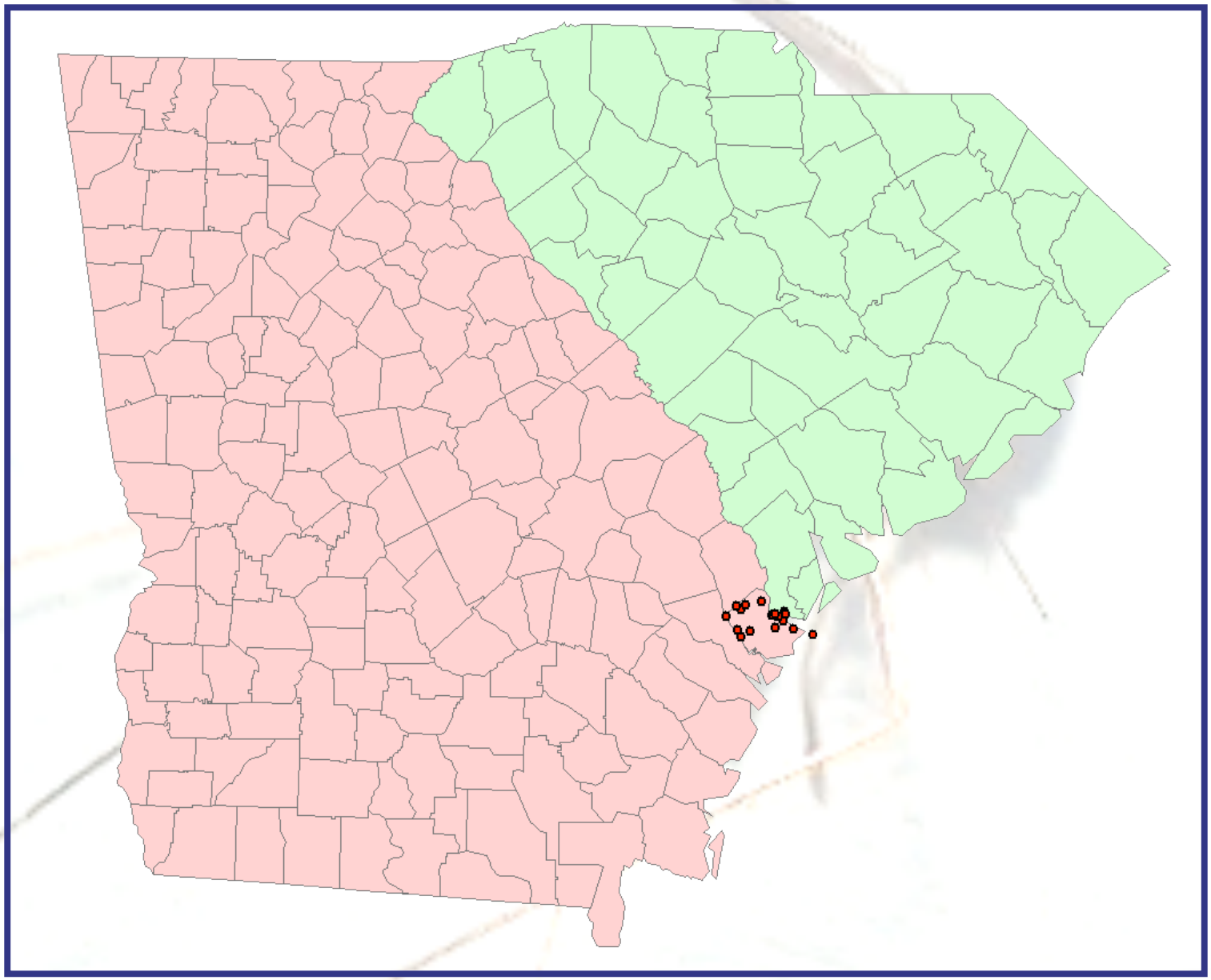


In 2007 *Culex coronator* adults were collected in small numbers (1-12) from mid October through mid December. In 2008 *Culex coronator* were collected in small to large numbers (1-347) throughout the year. In 2007 a total of 75 adult *Culex coronator* were collected at 12 locations, while in 2008 a total of 970 were captured at 14 locations.

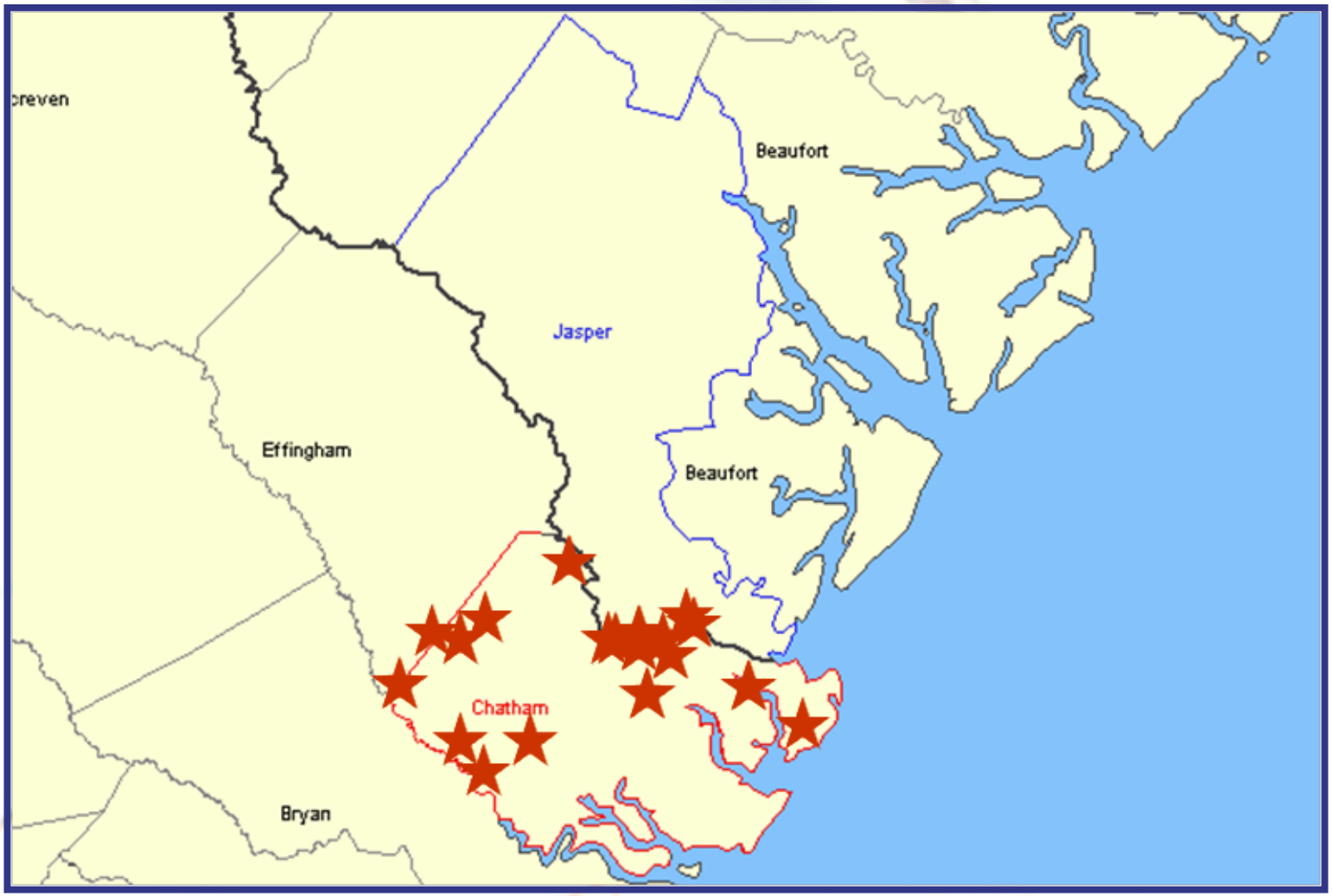
Summary of *Culex coronator* trap data, 2007-08.

Year	Total Sites	Total number
2007	12	75
2008	14	970
Total	19	1045

In 2007 and 2008 *Culex coronator* adults were collected in 15 Chatham County locations and 4 Jasper County locations.



These sites include inland, intercoastal, and coastal areas widely distributed in our service area.



The adult habitat for *Culex coronator* is varied throughout the known range of this species.

Habitat Description	Location	Source
Upland forest (broad-leaf, deciduous forest); Low-lying riverine terrain	British Honduras	Bertram (1971)
Mangrove swamp	Southern Antilles	Belkin and Heinemann (1976)
Within tree line adjacent to old beaver pond; backyard area; veterinary kennels; shady, damp site near lift station in an old forest area; recently cleared forest in housing area; athletic field near tree line; recently cleared tree line with heavy organic debris	Louisiana	Debboun et al. (2005)
Undisturbed areas composed of open fields; vast pine forests; and creek bottoms containing mature hardwoods	Mississippi	Goddard et al. (2006)
Residential area next swamp creek; coastal sand ridge; clearing in mixed oak, sweet gum, magnolia forest; next to small pond; residential park area next to cattail marsh; edge of cypress swamp surrounded by oaks and thick understory; cattle pasture area; waterfront peninsular area heavily impacted by hurricanes; cemetery; horse corral	Florida	Smith et al. (2006)
Near freshwater creek in clearing on a wooded lot	Mississippi	Foppa et al. (2007)
Coastal zones; delta floodplains; mixed pine and hardwood forests; open fields; campgrounds; urban areas; and cemeteries	Alabama	McNelly et al. (2007)
Older urban areas; woodlot in older neighborhood; older heavily wooded neighborhood	Georgia	Kelly et al. (2008)

The adult habitat for *Culex coronator* in Chatham County, Georgia and Jasper County, South Carolina includes coastal, intercoastal and inland areas.

Site Name (s)	General Location	Habitat
Tide Gate, Mid Road, East of Gas line, & North of 13-A	DMCA's (Jasper County, SC)	Intercoastal area near the Back River (Savannah River), dominated primarily by china-berry, hackberry, and mulberry
St. Peter's	Wilmington Island (Chatham County, GA)	Intercoastal island dominated by slash/loblolly pine, sweet gum, and oaks
17th Street	Tybee Island (Chatham County, GA)	Barrier Island, residential backyard next to vacant lot
1807 E 64th Street	Midtown Savannah (Chatham County, GA)	Mixed hardwood forest buffer area between older neighborhood and multi-lane parkway
Love's, Fort Argyle Road	Ogeechee River floodplain (Chatham County, GA)	River flood plain composed primarily of black gum, sweet gum, cypress, water oak, red maple, and tupelo
Burton Road	Unincorporated area near older subdivision (Chatham County, GA)	Pinewoods area with wax myrtle understory
Maple Street	Bloomingdale (Chatham County, GA)	Older residential neighborhood bordered by wooded lots (mostly pine/oak) on two sides
Huckleberry Road	Ogeechee River floodplain (Chatham County, GA)	Sandy ridge surrounded by flood plain (pine, cypress, hardwood area)
Fort Argyle Road	Ogeechee River floodplain (Chatham County, GA)	Rural home site in former loblolly pine plantation adjacent to cypress/hardwood river swamp
East Hutchison Island, West Hutchinson Island, & Hutchinson Island Gravid trap	Hutchinson Island (Chatham County, GA)	Undeveloped area composed of deciduous woods, including mulberry and china-berry
White Dogwood Lane	Pooler (Chatham County, GA)	Along small greenway comprised of mostly pines in newer subdivision adjacent large borrow pit

Culex coronator **adults have been captured in twelve sites in the Chatham County, Georgia/Jasper County, South Carolina area. These areas range from residential backyards to undeveloped woodlands.**

Burton Road site: pinewoods/wax myrtle habitat adjacent to residential subdivision

St. Peter's site: Buffer zone between athletics field and residential subdivision

Tybee Island site: Older neighborhood backyard along fence line to vacant lot

Ft. Argyle site: Rural residence bordering Ogeechee River swamp

Culex coronator **specimens were collected almost exclusively in CDC light traps, although, a total of four specimens were captured in gravid traps deployed at two different locations. A single specimen captured in the backyard of a residence in an older neighborhood immediately outside a utility building housing a small rabbit colony, and three specimens were caught (on two separate trap nights) in an undeveloped area comprised of mixed deciduous woods.**

Maple Street site: older residential subdivision

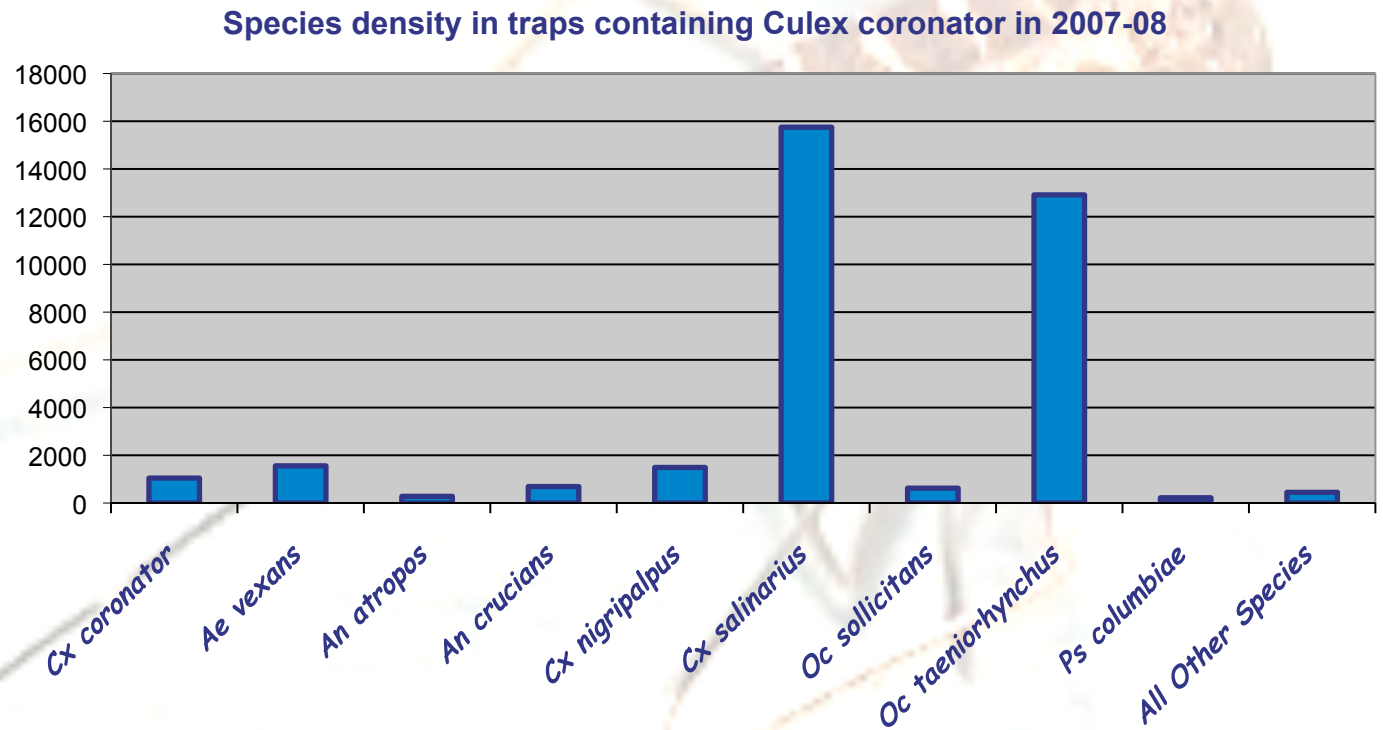
West Hutchinson Island site: mixed deciduous woods

In 2007 *Culex coronator* larvae were collected at only a single site located near one of our CDC light trap locations in South Carolina. In 2008 larvae were found at four additional sites (two in South Carolina and two in Georgia).

The larval habitat for *Culex coronator* is somewhat diverse throughout the known range of this species.

Habitat Description	Location	Source
Stagnant shady or sunny permanent pools	Panama	Arnett (1950)
Temporary rain-filled pools and artificial containers	Rio Grande Valley (Texas)	Carpenter and LaCasse (1955)
Roadside pools	British Honduras	Bertram (1971)
Floodplain water, ground pools and artificial containers	Arizona	McDonald et al. (1973)
Temporary ditches, permanent ponds, semi permanent stream margins and pools	Southern Antilles	Belkin and Heinemann (1976)
Pits; ground pools; rock pools; cement trough; seepage areas; flood pools; road ruts; log holes; marshy depressions; stream pools; roadside ditches	Belize	Pecor et al. (2002)
Small woodland spring; roadside ditches/swales	Mississippi	Varnado et al. (2005)
Temporary pools; rock holes; tree holes; nonessential rubbish; laundry/kitchen items; tin cans and bottles; discarded appliances; used tires; water storage tanks; batea; animal water containers; buckets; flower vases and potted plants; septic tanks; roof gutters	Yucatan, Mexico	Najera-Vazquez et al. (2004)
Poorly drained roadside ditch; small spring; swale	Mississippi	Goddard et al. (2006)
Fungal cups	Brazil	Ferreira et al. (2001)

Traps containing *Culex coronator* also collected 26 other species of mosquitoes. However, numbers and species diversity varied considerable between trap sites. Among the mosquito species captured with *Culex coronator* adults, *Culex salinarius* and *Ochlerotatus taeniorhynchus* were the most numerous.



Originally *Culex coronator* larvae were found in only one location within the Chatham County, GA/Jasper County, SC area. This site is characterized as a seepage pool resulting from percolation through the road embankment/dike system.

In 2008, *Culex coronator* larvae were first collected in July on Hutchinson Island (Georgia) near a trap site that had recently caught a relatively high number of adults. This area is composed of lows and ruts formed by heavy equipment that are influenced by both rain and extreme high tide events, and low woodlands that appear to collect run-off from a nearby sprinkler system.

Later in 2008, *Culex coronator* larvae were collected in two locations along the Savannah River dredge sites (South Carolina) near a trap site that had regularly caught adults. One of these consisted of the "Header Ditch" which surrounds a DMCA, while the other is composed of depressions and ruts formed by feral hog activity. The DMCA header ditch tends to be permanent water maintained by rainfall and occasional pumping during river dredging operations (June, 2005), although the latter site holds water on a more temporary basis resulting from rain events and periodic tidal inundation.

Culex coronator is primarily a large-sized mammal feeder, although it will feed on smaller mammals and birds

Organism	Location	Source
Rabbit	Southern-southwestern United States	Suyemoto et al. (1973)
Horse, burro	Texas, New Mexico	Jones et al. (1977)
Human	British Honduras	Bertram (1971)
Human	Brazil	Roberts and Hsi (1979)
Human	Peru	Pecor et al. (2000)
Carolina chickadee, tufted titmouse, deer, horse, raccoon, cat, dog, otter, opossum	East Baton Rouge Parish, LA	Mackey (2007)

The public health importance of *Culex coronator* is largely unknown. However, viruses have been detected in specimens from various areas of its range.

Virus	Location	Source
St. Louis encephalitis	Trinidad, West Indies	Aitken et al. (1964)
St. Louis encephalitis	Brazilian Amazon	Vasconcelos et al. (1991)
Venezuelan encephalitis	Southeastern Mexico	Scherer et al. (1971)
Ilheus virus	Amazon Basin (Peru)	Turell et al. (2005)
West Nile virus	United States (Texas)	http://www.cdc.gov/ncidod/dvbid/westnile/mosquitospecies.htm Kelly et al. (in print)
West Nile virus	Louisiana	Roy (2005)
West Nile virus	East Baton Rouge Parish, LA	Mackay (2007)

Literature Cited

- Aitken, T. H. G., W. G. Downs, L. Spence, and A. H. Jonkers. 1964. St. Louis encephalitis virus isolations in Trinidada, West Indies, 1953-1962. Am. J. Trop. Med. Hyg. 13(3): 450-451.
- Arnett, R. H. 1950. Notes on the distribution, habits, and habitats of some Panama Culicines (Diptera: Culicidae). 1950. NY Entomological Soc. 58: 99-116.
- Belkin, J. N. and S. J. Heinemann. 1976. Collection records of the project “Mosquitoes of Middle America” Part 6. Southern Antilles: Barbados (BAR), Dominica (DOM), Grenada (GR, GRR), St. Lucia (LU), St. Vincent (VT). Mosq. Syst. 8:237-297.
- Bertram, D. S. 1971. Mosquitoes of British Honduras, with some comments on malaria, and on arbovirus antibodiesa in man and equines. Trans. Roy. Soc. Trop. Med. Hyg. 65(6): 742-762.
- Bradley, K. K. 2004. Oklahoma State Report: Twenty-fifth Biennial State Public Health Vector Control Conference. http://www.cdc.gov/ncid/dvdid/westnile/conf/25thbiennialvectorcontrol/index.htm
- Carpenter, S. J. and W. J. LaCasse. 1955. Mosquitoes of North America (north of Mexico). Berkeley, CA, Univ. Calif. Press. 360 p.
- Darsie, R. F., Jr. and R. A. Ward. 2005. Identification anf geographic distribution of the mosquitoes of North America, north of Mexico. Gainesville: Univ. Press of Florida/State Univ. System. 383 p.
- Debboun, M., D. D. Kuhr, L. M. Rueda, and J. E. Pecor. 2005. First record of *Culex* (*Culex*) *coronator* in Louisiana, USA. J. Am. Mosq. Control Assoc. 21: 455-457.
- Ferreira, R. L. M., A. F. Oliveira, and N. Hamada. 2001. Occurrence of larval Culicidae (Diptera) in water retained in *Aquascypha hydrophora* (Fungus: Stereaceae) in Central Amaazonia, Brazil. Mem. Inst. Oswaldo Cruz. 96:1165-1167.
- Foppa, I. M., C. L. Evans, A. Wozniak, and W. Wills. 2007. Mosquito fauna and arbovirus surveillance in a coastal Mississippi community after Hurricane Katrina. J. Am. Mosq. Control Assoc. 23: 229-232.
- Goddard, J., W. C. Varado, B. A. Harrison. 2006. Notes on the ecology of *Culex coronator* Dyar and Knab, in Mississippi. J. Am. Mosq. Control Assoc. 22: 622-625.
- Jones, J. W., M. J. Turell, M. R. Sardelis, D. M. Watts, R. E. Coleman, R. Fernandez, F. Carbajal, J. E. Pecor, C. Calampa, and T. A. Klein. 2004. Seasonal distribution, biology, and human attraction patterns of Culicine mosquitoes (Diptera: Culicidae) in a forest near Puerto Almendras, Iquitos, Peru.
- Kelly, R, D. Mead, B. A. Harrison. 2008. The discovery of Culex coronator Dyar and Knab (Diptera: Culicidae) in Georgia. Proc. Entomol. Soc. Wash. 110:258-260.

Literature Cited (cont)

- Mackay, A. J. 2007. Detection of West Nile virus activity in male and female mosquitoes, and evaluation of host-utilization patterns of mosquitoes, in East Baton Rouge, Louisiana [Ph.D. dissertation]. Baton Rouge, LA: Louisiana State University.
- McDonald, J. L, T. P. Sluss, J. D. Lang, and C. C. Roan. 1973. Mosquitoes of Arizona. Agric. Exp. Sta. Univ. Ariz., Tucson. Tech. Bull. 205:21 p.
- McNelly, J. R., M. Smith, K. M. Micher-Stevens, and B. A. Harrison. 2007. First records of *Culex coronator* from Alabama. J. Am. Mosq. Control Assoc. 23: 473-475.
- Najera-Vazquez, R., F. Dzul, M. Sabido, E. Tun-Ku, and P. Manrique-Saide. New distribution records of mosquitoes (Diptera: Culicidae) for Yucatan, Mexico. 2004. Entomological News 115:181-190.
- Pecor, J. E., J. Jones, M. J. Turell, R. Fernandez, F. Carbajal, M. O'Guinn, M. Sardalis, D. Watts, M. Zyzak, C. Calampa, and T. A. Klein. 2000. Annotated checklist of the mosquito species encountered during arboviral studies in Iquitos, Peru (Diptera: Culicidae). J. Am. Mosq. Control Assoc. 16: 210-218.
- Pecor, J. E., R. E. Harbach, E. L. Peyton, D. R. Roberts, E. Rejmankova, S. Manguin, and J. Palanko. 2002. Mosquito studies in Belize, Central America: Records, taxonomic notes, and a checklist of species. J. Am. Mosq. Control Assoc. 18: 241-276.
- Roberts, D. R. and B. P. His. 1979. An index of species abundance for use with mosquito surveillance data. Environ. Entomol. 8:1007-1013.
- Scherer, W. F., R. W. Dickerman, A. Diaz-Najera, B. A. Ward, M. H. Miller, and P. A. Schaffer. 1971. Ecologic studies of Venezuelan encephalitis virus in southeastern México. Am. J. Trop. Med. & Hyg. 20:969-979.
- Smith, J. P., J. D. Walsh, E. H. Cope, R. A. Tennant, Jr., J. A. Kozak, III, and R. F. Darsie, Jr. 2006. Culex coronator Dyar and Knab: A new Florida species record. J. Am. Mosq. Control Assoc. 22: 330-332.
- Turell, M. J., M. L. O'Guinn, J. W. Jones, M. R. Sardelis, D. J. Dohm, D. M. Watts, R. Fernandez, A. Travassos da Rosa, H. Guzman, R. Tesh, C. A. Rossi, G. V. Ludwig, J. A. Mangiafico, J. Kondig, L. P. Wasieloski, Jr., J. Pecor, M. Zyzak, G. Schoeler, C. N. Mores, C. Calampa, J. S. Lee, and T. A. Klein. 2005. Isloation of viruses from mosquitoes (Diptera: Culicidae) collected in the Amazon Basin region of Peru. J. Med. Entomol. 42:891-898.
- Varnado, W. C., J. Goddard, and B. A. Harrison. 2005. New state record of *Culex coronator* Dyar and Knab (Diptera: Culicidae) from Mississippi. Proc. Entomol. Soc. Wash. 107:476-477.
- Vasconcelos, P. F. da C., J. F. S. Travassos da Rosa, A. P. de A. Travassos da Rosa, N. Dégallier, F. de P. Pinheiro, G. C. Sá Filho. 1991. Epidemiologia das encefalites por arbavírus na Amazônia brasileira. Rev. Inst. Med. Trop. S. Paulo. 33:465-476.


Thank You