

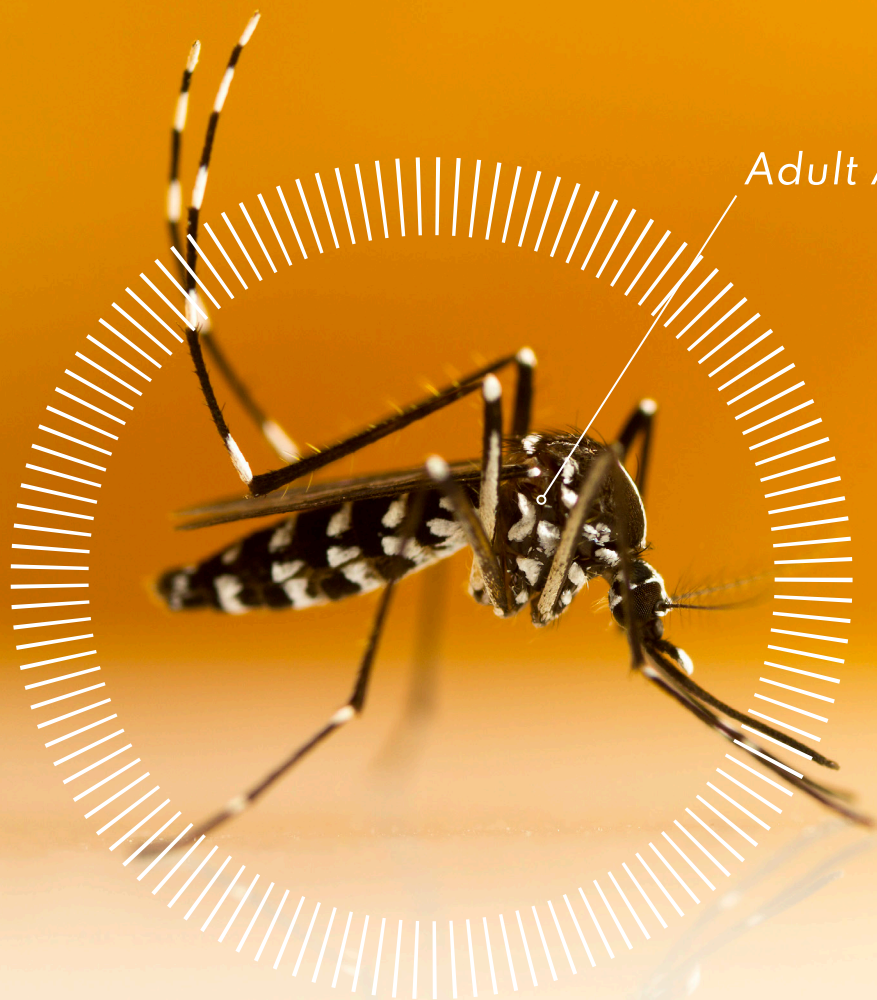
# MOSQUITO

## **Biology and Behavior**

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Mosquitoes have been documented as pests in Georgia since the earliest English settlers arrived on the coast in the early 1700s, and the insects were sure to be a problem before that. Mosquitoes continue to be the most important public health pest in Georgia, transmitting a variety of pathogens to people, pets, and wildlife. Each year, cases of mosquito-borne diseases are reported in Georgia, and the sheer nuisance of mosquito populations has resulted in a robust mosquito control profession. Today, integrated mosquito management (IMM) is conducted using the widely accepted concept of integrated pest management (IPM). This approach uses all of the available and necessary techniques and products to conduct a comprehensive program in which pest populations are efficiently managed to minimize economic damage, public health risk, and non-target impacts. To suppress mosquito populations using an IPM-based approach, it is critical to understand the biology and behavior of these important pests.



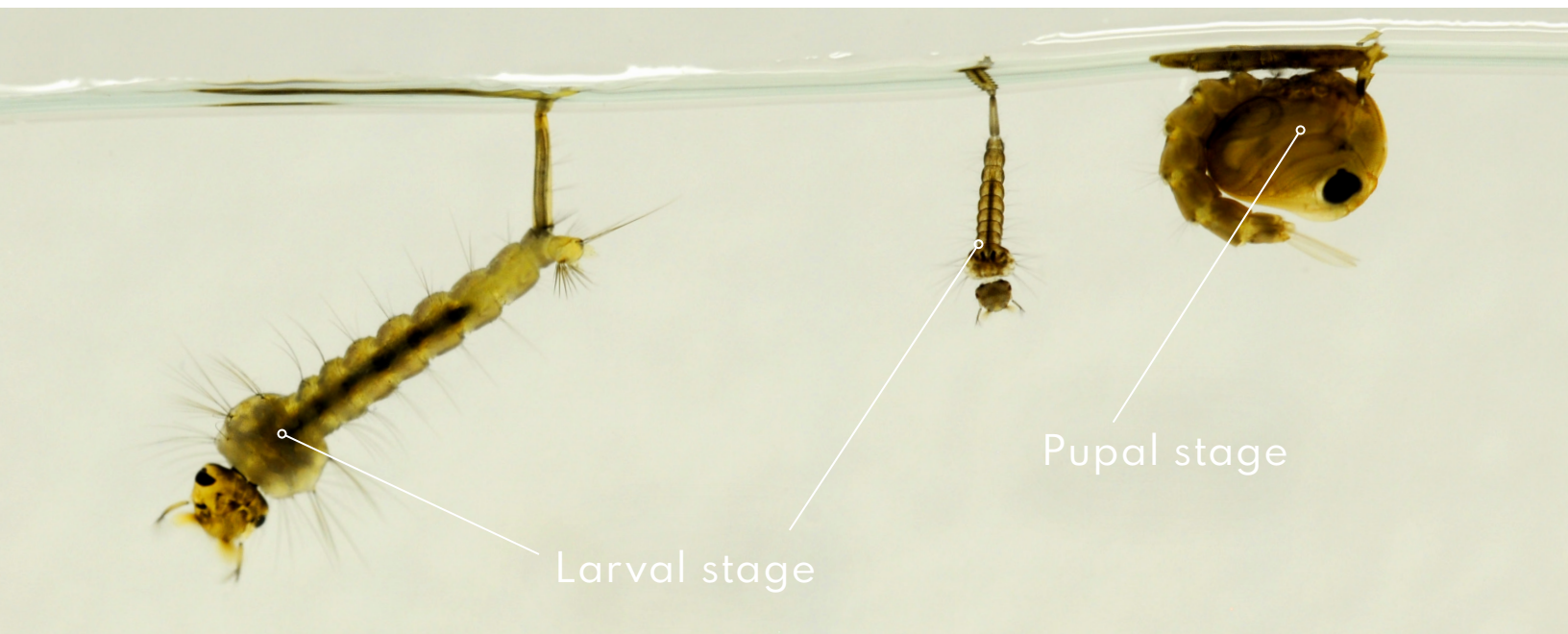
*Adult Aedes albopictus*

**There are  
species of **63**  
mosquitoes known  
to live in Georgia.**

Consequently, there are a wide range of life histories and habitats that are routinely encountered. This large number of species is representative of the size of Georgia and the diverse types of habitat that are found from the mountains in the north to the swamps and salt marshes in the south and east. This diversity also means that our residents deal with a variety of mosquito problems and populations depending on where they're located in our state.

# Life cycle of a mosquito

Despite their diversity, there are a number of characteristics that are consistent for all mosquito species. Mosquito eggs will be deposited on soil that will become flooded, above the water line in natural or artificial containers, or on the surface of standing water. All mosquitoes require water for their larval and pupal development. The larval and pupal stages are truly aquatic, typically requiring water for seven or more days to complete their development. Immediately after the eggs hatch, the newly emerged larvae begin feeding on small particles (e.g., detritus, microorganisms, zooplankton) in their aquatic habitats. The larvae are legless and wormlike with a defined head capsule and many spines and setae (stiff hair). The mouthparts of the mosquito larvae are composed of a complex set of setae and spicules (pointed structures) configured into what are commonly called mouth brushes. The combined action of the brushes and the physical pumping of the mouth opening creates flow to aid ingestion. The larvae of many species will also graze or nibble on surfaces in the larval habitat. A few species are predacious on other mosquito larvae and small organisms.



## Larval stage

The first instar larvae are very small (around 1 millimeter) and nearly clear, making them very difficult to see in the field. The larvae molt and develop through three more instars, increasing to nearly 1 centimeter in length. The larvae of most mosquito species come to the surface of the water to obtain oxygen when they are not feeding. Larvae are commonly observed suspended in various positions from the water's surface by their respiratory siphon (an organ that serves as a breathing tube) or palmate setae (stiff structures that grow in a hand shape). Mosquito larvae are often called “wrigglers” due to their flexing motion when disturbed. The larvae of the Genus *Mansonia* and *Coquillettidia* have a modified siphon that is pointed and inserted into aquatic plant roots to obtain oxygen.

## Pupal stage

The pupal stage is a period of transition and appears with the fourth molt. Because it is lighter than water, the pupae typically rests at the water's surface until disturbed when it dives down into the water column in a tumbling motion. As a result of this movement, the pupae are commonly called “tumblers.” The buoyancy of the pupae results from an air cavity that occurs between the wings of a developing adult. Near the end of the pupal stage, the pupae will become sluggish and extend its abdomen nearly parallel to the water's surface in preparation for the emergence of the adult.



# Adult stage

The adult mosquito emerges onto the water's surface by swallowing some of the air within the pupal skin. Using internal pressure and muscular action, the emerging adult forces a split in the back of the pupae. The adult slowly works its way out of the pupal skin, using the cast skin as a float until its body and wings can harden and dry. This delicate process requires still water to allow a successful emergence from the aquatic environment. Once the adult mosquito has hardened, it will disperse from the larval habitat in search of a mate and food sources. The distance that mosquitoes disperse from their larval habitats is typically species specific. Our most common container breeding mosquito, *Aedes albopictus*, seldom moves more than 100 to 200 yards from its larval habitat. Consequently, when confronted with a nuisance population, surveillance is focused to a short distance. Many of the more common, permanent water species will fly up to a mile from their larval habitat. Salt marsh mosquitoes can move great distances from their larval habitats, making larger-scale control efforts more important in coastal regions.

# Mosquito behavior

The male and female mosquito both feed on nectar and plant juices to provide energy for flight, but only the female seeks a blood meal to acquire the nutrients typically required to stimulate egg production. Host attractiveness to a female mosquito is based upon many cues, with sight and smell being the two most important. **People dressed in dark colors, actively moving about, and those who exhale more carbon dioxide are most attractive to host-seeking mosquitoes.**

Upon taking a blood meal, the female mosquito moves to a protected area to digest the blood meal and produce her first batch of eggs. Once the eggs have developed, the female will locate a preferred larval habitat (e.g., container, swamp, wetland) and deposit her eggs. The life span of adult mosquitoes varies greatly depending on the time of year and species. During the spring and fall, mosquitoes can live many weeks, while in the heat of the summer, it could be two weeks or less. Some species are long lived and overwinter as inseminated females, so it is not surprising to see an occasional mosquito on a warm February afternoon. Other species will overwinter as eggs, which hatch in the spring after the eggs are covered with water and temperatures begin to warm.

**Mosquitoes are best known for their biting habits and because they are often vectors of important disease-causing pathogens. The best way to prevent a mosquito-borne disease is to prevent the mosquito bite. Residents must work to eliminate all forms of standing water, particularly focusing on sources that can be permanently eliminated, like tires and planters. However, sometimes larval habitats are expansive or inaccessible. In these circumstances, mosquito bites can be reduced by wearing light colored, loose-fitting pants and long-sleeved shirts and by using a repellent approved by the U.S. Environmental Protection Agency.**

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Circular 1155

May 2019

