

Aedes albopictus, the Asian tiger mosquito

Distribution

The Asian tiger mosquito, *Aedes albopictus*

The Asian tiger mosquito, *Aedes albopictus* has become one of the major mosquito pest species throughout most of southcentral and eastern United States. Over the past 30 years, this invasive and particularly aggressive daytime biting mosquito has spread from its Asian origin to 5 continents. It has now been detected in at least 38 countries and has become established in 28.

In the U.S., *Ae. albopictus* first appeared in Houston, TX, in 1985 and has since spread to 1,368 counties in 40 states and the District of Columbia. Over the last 3 years, the presence of *Ae. albopictus* has been reported from numerous new locations reflecting an increased surveillance effort. On the map on the right side (fig. 1), all counties with block dots represent new detections, and it is very likely that many other counties, especially in states like Texas, Arkansas, Florida, Georgia, and Kentucky, may also have as yet undetected populations of *Ae. albopictus*.

Ae. albopictus is a traveler. A primary reason for the rapid and widespread distribution of the Asian tiger mosquito is that it moves easily in shipments of lucky bamboo and in used tires across the world. In Europe, the spread of this species has largely followed major highways where mosquitoes can hitch a ride from infested to non-infested areas in cars, trucks, and buses.

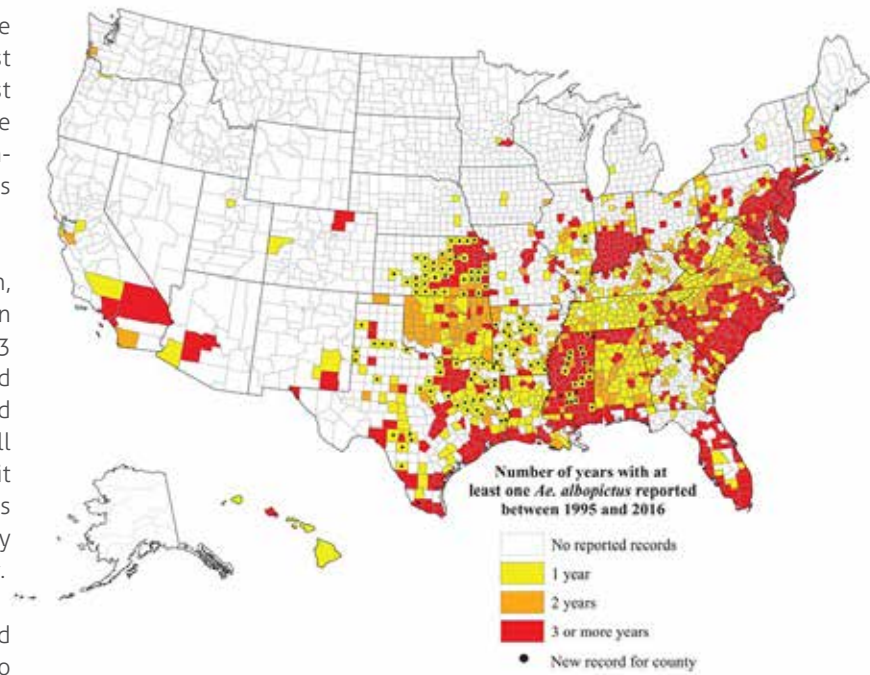


Fig. 1: Map from Hahn et al., 2017, showing the current distribution of *Aedes albopictus* in the US based on documented collection records

Identification



The dark-colored Asian tiger mosquito ranges in size from about 3–10 mm long. A single silvery-white stripe that begins on the head and continues down the top of the thorax is a key character to identify the Asian tiger mosquito. Prominent white markings on the legs are another easily visible characteristic (fig. 2).

Fig. 2: *Aedes albopictus*

The life cycle of tiger mosquitoes

The life cycle of *Ae. albopictus* is depicted in the graphic below (fig. 4). In its native range, *Ae. albopictus* is a treehole mosquito, and it inhabits densely vegetated rural areas. However, it has shown great adaptability in colonizing new habitats in urban and suburban areas.

Females have utilized cemetery flower pots, bird baths, soda cans, buckets, plant saucers, plastic drainpipe extensions, and many other man-made water holding containers as sites to deposit eggs. Tires are particularly useful for mosquito reproduction as they are often stored outdoors and effectively collect and retain rain water for a long time. Eggs, which are desiccation resistant, are deposited above the water line in containers subject to flooding (fig. 3).



Fig. 3: Places where tiger mosquitoes are likely to lay their eggs

When eggs are covered by water, the larvae hatch and begin a four-stage development. Larvae feed primarily on organic material that they filter out of the water with their mouthparts. They can be commonly observed hanging at the surface of the water where they breathe through a snorkel-like siphon at the tip of the abdomen. The length of time required to complete larval development is dependent upon temperature and availability of food, and it is typically completed between 6 and 10 days during the summer months in the US.

At the completion of larval development, the fourth-stage larva molts into the pupal stage. The pupa is a non-feeding stage where the mosquito changes from the larval form into an adult insect. Pupae can be observed tumbling in the water or hanging at the surface where they breathe through two snorkel-like trumpets at the front end. The pupal stage usually lasts a few days, and then the adult mosquito emerges and seeks a resting site in low vegetation.

Adult mosquitoes of both sexes feed on sweet plant juices and nectar to meet their energy requirements. Mating takes place 2 to 3 days after adult emergence, and females take their first bloodmeal shortly afterwards.

Only female mosquitoes feed on blood, which they require to provide protein for egg production.

A female produces 50 to 150 eggs per oviposition. There are 1 to 4 egg laying cycles over the course of a female's lifetime. In the more northern parts of its U.S. distribution, the tiger mosquito has the ability to sense shorter day lengths towards the end of the summer and lay eggs capable of undergoing developmental arrest (diapause) in order to survive cold winter temperatures.

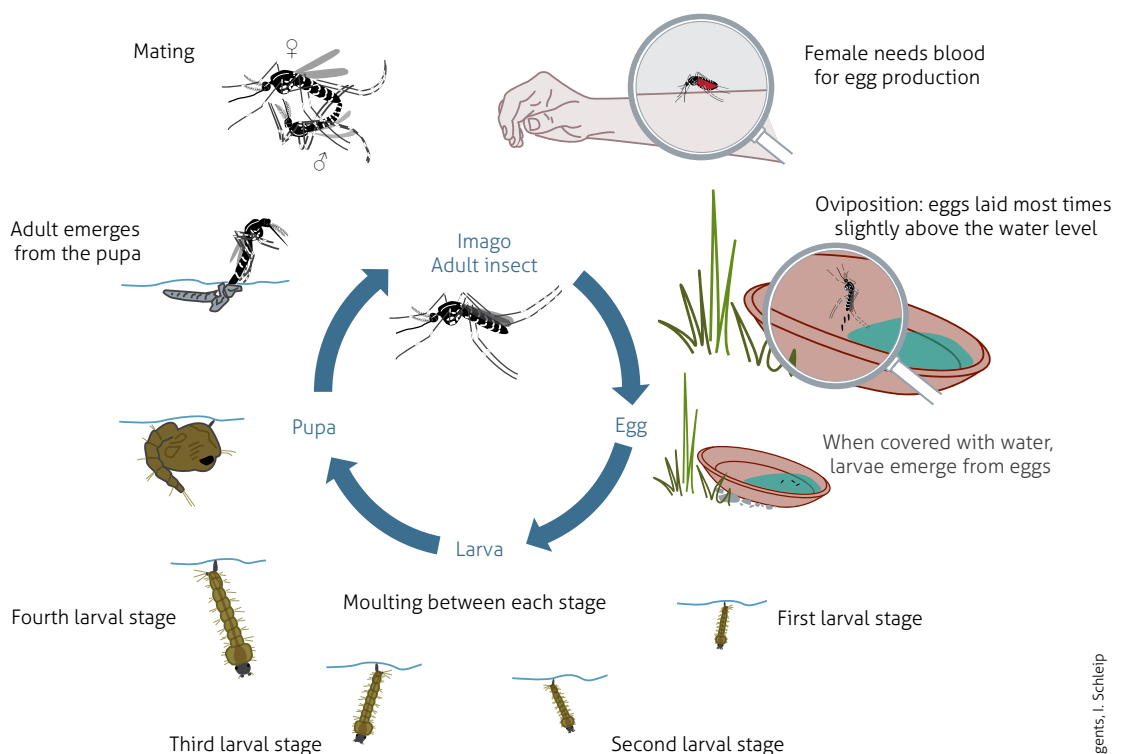


Fig. 4: Life cycle of *Aedes albopictus*

Behavior

Unlike other nuisance mosquitoes, *Ae. albopictus* is primarily a day biter. In many communities, it has become the major pest mosquito and has taken the joy out of spending time in the yard and garden due to its unusually aggressive biting. Adults tend to rest near the ground in vegetation and readily bite if disturbed.

Ae. albopictus is usually an outdoor biting mosquito, but has also been collected biting indoors. It is fairly common for tiger mosquitoes to follow people indoors when doors are left open. *Ae. albopictus* adults fly close to the ground and do not fly in strong winds. They tend to have a short flight range and remain within a few hundred meters of where they completed their immature development.

What diseases do the Asian tiger mosquitoes transmit?

Asian tiger mosquitoes have been shown to be susceptible to infection with at least 32 viruses, including 13 that are present in the United States, as well as the parasite that causes heartworm in dogs. The most important viruses transmitted by *Ae. albopictus* include dengue, chikungunya, and Zika. The role of *Ae. albopictus* as a vector for dengue is well documented, and it has been responsible for the transmission of dengue virus in regions where *Ae. aegypti*, the primary vector, is absent or only present in low population (such as Hawaii).

Because the Asian tiger mosquito feeds on a variety of other animals besides humans, scientists consider it a potential "bridge vector", meaning that it may pick up disease agents from animals,

and transmit them to humans.

In the United States, its role as a bridge vector for zoonotic arboviruses is recognized for the West Nile virus (WNV) and eastern equine encephalitis virus (EEEV). With low abundance of *Culex quinquefasciatus* (Say), due to targeted vector control in Louisiana in 2002, transmission of WNV to humans was reported to be mediated by *Ae. albopictus*. Repeated isolation of EEEV from *Ae. albopictus* in Florida and its proven ability to transmit the virus have also provided ample evidence that *Ae. albopictus* can be a bridge vector for EEEV. Besides WNV and EEV, *Aedes albopictus* has also been shown to be a good vector of LaCrosse encephalitis.

Mosquito control

Cover breeding sites

Cover your rain barrels and other water containers with a tight fitting lid or net to keep mosquitoes out. Be sure the containers are tightly covered, since mosquitoes will find even the smallest opening to access water and lay eggs.

B.t.i.

Alternatively you can treat water holding containers regularly with a biological control agent such as B.t.i. (*Bacillus thuringiensis israeliensis*). This bacteria contains a specific protein that kills mosquito larvae when they ingest it. B.t.i. is harmless to vertebrates that drink the water, is biodegradable, and it is safe to use for watering garden plants. B.t.i. is effective only against the larval stages of mosquitoes, as the pupal stage is non-feeding and cannot ingest the bacteria.

This product is available in several easy to use formulations from garden and home centers and from online retailers.

Empty breeding sites

To avoid the accumulation of water, you should frequently empty flower pot saucers, watering cans, buckets, and other water holding containers. A warm summer enables the development of a mosquito population within one week in such water containers! Plant saucers and similar water holding containers can be filled with fine gravel to make them unsuitable for mosquito larval development.

Check gutters, pipes, and rain drains for blockages and clean them if necessary.

Clean breeding sites

Tiger mosquitoes most often lay their eggs on the sides of a container just above the water surface. Thoroughly cleaning the inner edge of a garden container with a cloth can easily remove eggs (figs. 5 and 6).

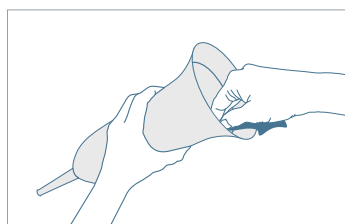


Fig. 5

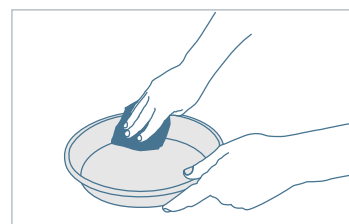


Fig. 6

An especially good time to do your cleaning is in conjunction with putting away pots and saucers and other outdoor containers for the winter. Removing eggs at this time can be an important measure to reduce the mosquito population in the following spring. The cloth used to clean the containers should be frozen for at least 48 hours before throwing away to insure eggs are dead.

Mosquito screens on doors and windows

Prevent mosquitoes from entering your house with window screens. Keep sliding porch screens closed.

Long, light, and loose fitting clothing

Wearing light-colored, loose fitting clothing with long sleeves will discourage mosquitoes from biting.

Mosquito control

Mosquito repellents

Numerous commercially available mosquito repellents can be very effective in deterring biting mosquitoes. The Centers for Disease Control and Prevention (CDC) has identified products containing the following active ingredients to offer reasonably long lasting protection: DEET, Picaradin, oil of lemon eucalyptus (OLE or PMD), IR 3535 and 2-undecanone.

Biogents mosquito traps

Biogents mosquito traps can help to reduce local mosquito populations and are especially effective against tiger mosquitoes. The traps are the result of more than 16 years of academic research into the behavior of mosquitoes.

The **suction trap BG Mosquitaire with the BG-Sweetscent lure** targets mosquitoes that are seeking a host for a bloodmeal (fig. 7). The trap imitates a human being and attracts tiger mosquitoes with warmth, skin odor, and light-dark contrasts. A single fan sucks the attracted mosquitoes into a catch bag where they remain captured and finally dry out and die. Through continuous use of Biogents suction traps, a tiger mosquito population can be diminished by up to 80% (fig. 9). The trap is for outdoor use and best positioned in the humid, wind protected, and shady location. This type of location is often used by mosquitoes as a resting site.

The **passive BG-GAT trap** (Gravid *Aedes* Trap) targets tiger mosquitoes that are looking for a place to lay their eggs (fig. 8). This trap does not need electricity, is flexible in positioning and low cost due to its simple design and easy maintenance. Biogents recommends a combination of both trap types to most effectively reduce the local mosquito population in your backyard.



Fig. 7: BG-Mosquitaire



Fig. 8: BG-GAT

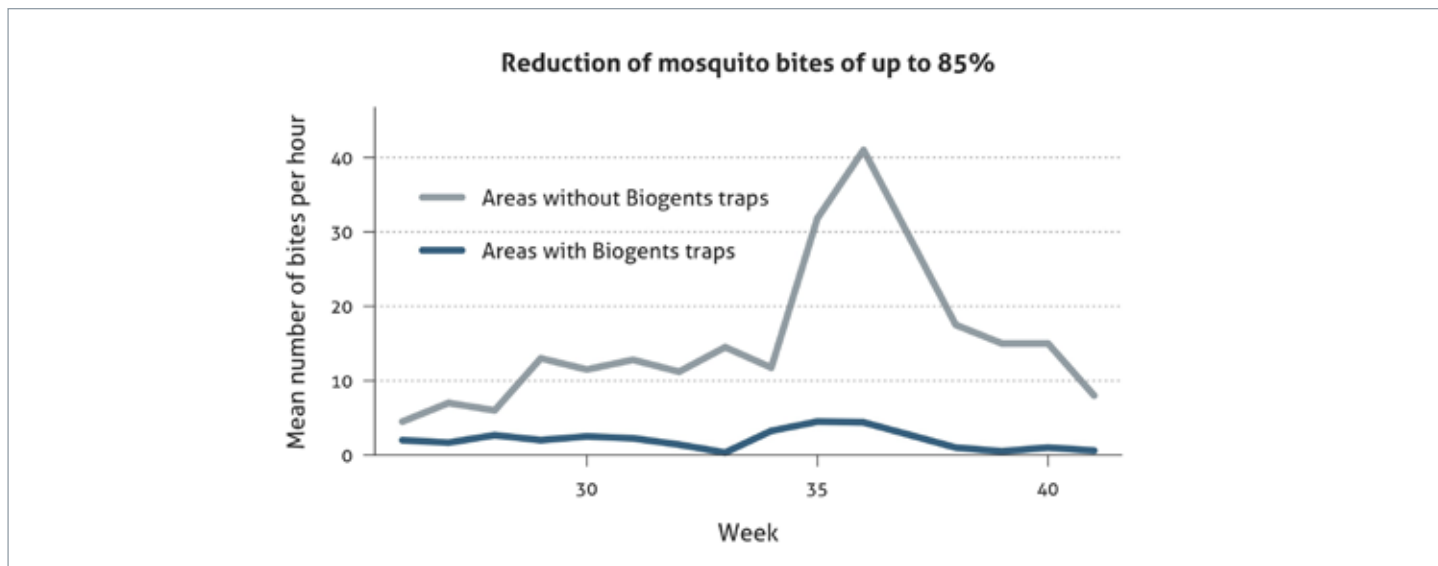


Fig. 9: Effect of Biogents mosquito traps on biting rates in three test areas in Cesena, Italy, in comparison to areas without Biogents traps. Source: Englbrecht C., Gordon S., Venturelli C., Rose A., and Geier M. (2015). Evaluation of BG-Sentinel Trap as a Management Tool to Reduce *Aedes albopictus* Nuisance in an Urban Environment in Italy, Journal of the American Mosquito Control Association, 31(1):16-25.