

Aedes albopictus (insect)

Taxonomic name: *Aedes albopictus* (Skuse, 1895)

Synonyms: *Culex albopictus* Skuse, 1895

Common names: Asian tiger mosquito (English), forest day mosquito (English), mosquito tigre (Spanish), moustique tigre (French), tiger mosquito (English), tigermücke (German), zanzare tigre (Italian)

Life form: insect

The Asian tiger mosquito is spread via the international tyre trade (due to the rainwater retained in the tyres when stored outside). In order to control its spread such trading routes must be highlighted for the introduction of sterilisation or quarantine measures. The tiger mosquito is associated with the transmission of many human diseases, including the viruses: Dengue, West Nile and Japanese Encephalitis. Many countries around the world have been colonized. Some events in Europe have been correlated to used tyre imports (Italy, France, Belgium) whereas other are of unknown origin and not related to tyres (Spain) and at least one (Netherlands) seems to be mediated by imports of gardening plants.

Description

Adults are known as tiger mosquitoes due to their conspicuous patterns of very black bodies with white stripes. Also, there is a distinctive single white band (stripe) down the length of the back. The body length is about 3/16-inch long. Like all mosquitoes, Asian tiger mosquitoes are small, fragile insects with slender bodies, one pair of narrow wings, and three pairs of long, slender legs. They have an elongate proboscis with which the female bites and feeds on blood.

Similar species

Aedes aegypti

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Occurs in:

agricultural areas, coastland, disturbed areas, natural forests, planted forests, range/grasslands, scrub/shrublands, urban areas, water courses, wetlands

Habitat description

Aedes albopictus is a treehole mosquito. In natural areas, larvae breed in tree-holes. In urban areas, the mosquitoes around bush vegetation in gardens. Larval habitats are mostly small containers from a wide variety of origins. It inhabits densely vegetated rural areas. However, its ecological flexibility allows it to colonize many types of man-made sites and urban regions. It may reproduce in cemetery flower pots, bird baths, soda cans and abandoned containers and water recipients. Tyres are particularly useful for mosquito reproduction as they are often stored outdoors and effectively collect and retain rain water for a long time. The addition of decaying leaves from the neighboring trees produces chemical conditions similar to tree holes, which provides an excellent substrate for breeding. *A. albopictus* can also establish and survive throughout non-urbanized areas lacking any artificial containers, raising additional public health concerns for rural areas (Eritja *et al.* 2005).

General impacts

The tiger mosquito is an aggressive outdoor day biter that attacks humans, livestock, amphibians, reptiles and birds (Eritja *et al.* 2005). In one survey of biting rates a level of 30 to 48 bites per hour was recorded (Cancrini *et al.* 2003).

Mosquitoes are vectors of many relevant human diseases from Malaria to filariasis (caused by *Dirofilaria immitis* (Eritja *et al.* 2005)). *A. albopictus* may be a matter of particular concern as a bridge vector for the West Nile virus because it inhabits rural areas and has a wide host range including birds, so that it can readily pass enzootic cycles to humans.

There are a total of four Flaviviruses, ten Bunyaviruses and seven Alphaviruses that *A. albopictus* is known to be receptive to in laboratory conditions. These include Yellow Fever, Rift Valley Fever, Chikungunya and Sindbis (all of which are present in the Mediterranean). Of these *A. albopictus* is known

to be receptive in field conditions to three Flaviviruses (Dengue, West Nile and Japanese Encephalitis), six Bunyaviruses (Jamestown Canyon, Keystone, LaCrosse, Potosi, Cache Valley and Tensaw) and one Alphavirus (EEE). Other circulating viruses in the Mediterranean that are pathogenic to humans (but which the receptivity of *A. albopictus* has not been observed or tested in the laboratory) include Israel Turkey virus, Tahyna and Batai.

Uses

Geographical range

Native range: *A. albopictus* occurs throughout the Oriental Region from the tropics of Southeast Asia, the Pacific and Indian Ocean Islands, north through China and Japan and west to Madagascar.

Known introduced range: The mosquito has been introduced in North and South America, with more recent introductions having occurred in Africa, Australia and Europe, where it is established in Albania and Italy and where it has been detected in France (Eritja *et al.* 2005). In the United States, it is established in most states east of the Mississippi River as far as Minnesota and Delaware (Source: Novak). In Europe, the patchy distribution is probably more related to specific transport incidents than to climatic needs of the species (Roger Eritja, pers.comm., 2006).

Invasion pathways to new locations

Nursery trade: The trade in "lucky bamboo" (*Dracaena* spp.) is increasing because it has cultural relevance within the Asiatic communities in the US and elsewhere, and it has also gained worldwide attention as a popular gift. Destination wholesale nurseries containing lucky bamboo in California were found to be infested by the tiger mosquito (Madon *et al.* 2002, in Eritja *et al.* 2005). Similarly large nurseries in the Guangdong province of China, where the climate is suitable for *A. albopictus*, should be kept under observation (Madon *et al.* 2002, in Eritja *et al.* 2005).

Ship: During the summer of 2001, containerised shipments from China of the plant known as Lucky Bamboo (*Dracaena* spp.) were found to contain *A. albopictus* on inspection by quarantine officers on arrival at Los Angeles, USA (Linthicum 2001, in Eritja *et al.* 2005). This route of spread became an issue only after traders swapped from dry freight to low cost shipping routes (which required the plants to be shipped in standing water to preserve them for the longer voyage).

Transportation of habitat material: Movement of moist vegetation, wet tires or water containers that hold eggs or larvae.

Local dispersal methods

Garden escape/garden waste

Road vehicles: May be spread in semi-trucks transporting used tires.

Self-propelled (local): The adult flight range is quite short, as expected for a scrub-habitat mosquito. The spreading of *A. albopictus* is quite slow; it has not spread along the Mediterranean coast from Italy to France, in spite of relatively short distances (Eritja *et al.* 2005).

Transportation of habitat material (local): Movement of moist vegetation, wet tires or water containers that holds eggs or larvae (Eritja *et al.* 2005).

Management information

Preventative measures: Starting in 1992, several countries in South America (Venezuela, Chile, Bermuda, Costa Rica, Argentina and Brazil) have dictated embargoes on used tyre importations, in an attempt to prevent mosquito introduction, protect local industries and prevent Dengue introduction into areas where a potential vector, *A. aegypti*, is already present (Eritja *et al.* 2005). (*A. aegypti* is a mosquito that caused outbreaks of Dengue and Yellow fever in Spain centuries ago (Eritja *et al.* 2005)). Local laws on the quarantining of used tyres have been passed in Italy, but no tyre legislation exists at the national level (Eritja *et al.* 2005). Source reduction strategies (such as larval or adult control within tyre dumps) have proven to be difficult and relatively inefficient due to the shape and abundance of the water surfaces (Eritja *et al.* 2005).

Quarantine and inspection measures in Australia have allowed detection of larval introductions of the tiger mosquito (Eritja *et al.* 2005). As immediate control measures have been applied, *A. albopictus* has not as of yet become established on this continent (Eritja *et al.* 2005).

Predicting the potential spread of the tiger mosquito may be important in alerting the appropriate authorities to take preventative action. The species could become established in northern Europe as far as the southern coast of Sweden and Norway (Eritja *et al.* 2005). Areas at risk in Europe would have mean winter temperatures higher than 0°, at least 500mm rainfall per year and a warm month mean temperature of 20°. It is believed that less than 300mm rainfall per year would make establishment extremely unlikely. While climate based forecasts are simplistic and because microclimates play major roles in species distribution they should not be ignored (Eritja *et al.* 2005).

In cases where no tyre trade is involved some other goods must be monitored, such as plant material (for e.g. Lucky Bamboo). When infestation occurs in densely populated urban or suburban areas, homeowners must be trained and public awareness must be raised within the collectivity *via* information campaigns, as only a decided and collective citizenship action in supressing containers in their properties can help in avoiding mosquito breeding (Roger Eritja, pers.comm., 2006).

Nutrition

Obtains energy by feeding on plant nectar. Females require blood to produce eggs. Although primarily a mammalian feeder, will accept blood from a wide variety of hosts.

Reproduction

The females lay desiccation-resistant eggs above the surface of the water in treeholes, tyres or other water-holding containers. They rely on rainfall to raise the water level and inundate the eggs for hatching. 150 to 250 eggs are laid per ovipostion. There are 1 to 4 ovipositions per female (ISSG 2004). The active reproductive period occurs in Japan and southwestern US from late Spring to early fall (Eritja *et al.* 2005). In Rome, larvae are found from March to November, but some females are active until December (Eritja *et al.* 2005). The eggs from strains colonizing temperate regions resist lower temperatures than those from tropical areas (Eritja *et al.* 2005). Additionally, in these strains, the combination of short photoperiods and low temperatures can induce the females to lay diapausing eggs which can hibernate (Hanson and Craig 1995, in Eritja *et al.* 2005). Overwintering is necessary north of the +10°C January isotherm (Eritja *et al.* 2005).

Lifecycle stages

The mosquito has four distinct life stages, which consist of egg, larva, pupa and adult. The first three stages occur in water. The adult is the freeflying insect that feeds on humans, other animals and the juice of plants (Lutz 2002).

This species has been nominated as among 100 of the "World's Worst" invaders

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Principal sources: Eritja, R., *et al.* 2005. Worldwide Invasion of Vector Mosquitoes: Present European Distribution and Challenges for Spain.

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