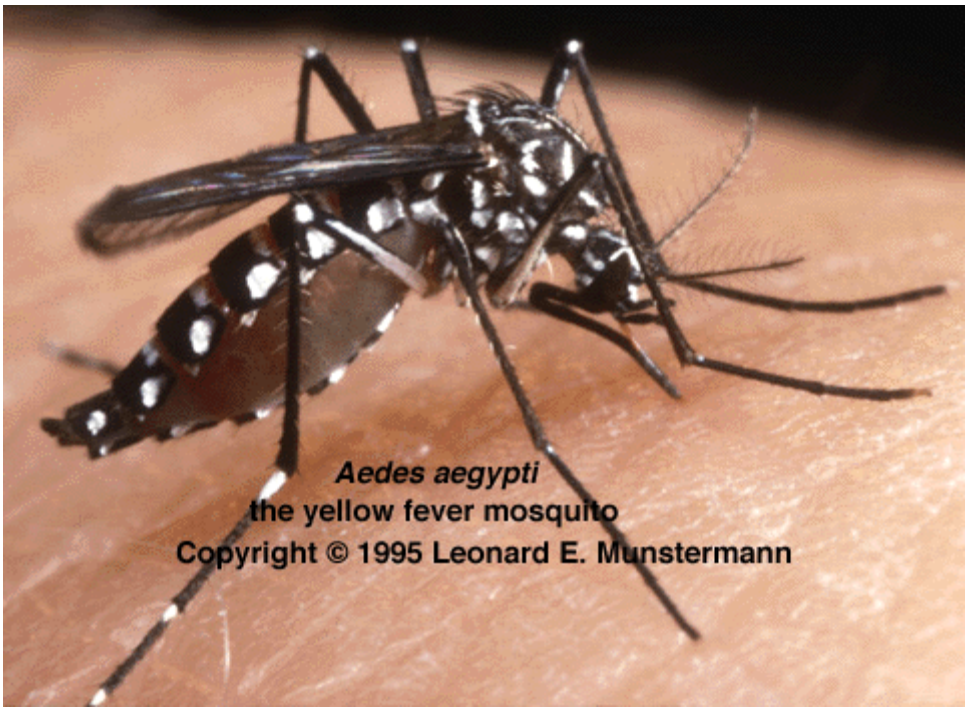
Aedes (*Stegomyia*) *aegypti* (*Linnaeus*)

yellow-fever mosquito

NZ Status: Not present – Unwanted Organism



Vector and Pest Status

Aedes aegypti is the primary vector of dengue fever and yellow fever (Black *et al*., 2002). In Asia, Chikungunya virus is thought to be transmitted by *Ae. aegypti* (Sam and Abu Bakar, 2006).

Aedes aegypti is also a known vector of Zika Virus, a flavivirus transmitted mainly by mosquitoes in the genus *Aedes* (Kauffman & Kramer 2017). It was discovered in 1947 in Ugandan monkeys and later identified in humans in 1952. More recently Zika gained worldwide attention when infection occurred In South America. The first reports of locally transmitted infection came from Brazil in May 2015. The rise in the spread of Zika virus has been accompanied by a rise in cases of microcephaly and Guillain-Barré syndrome (Kindhauser *et al*., 2016).

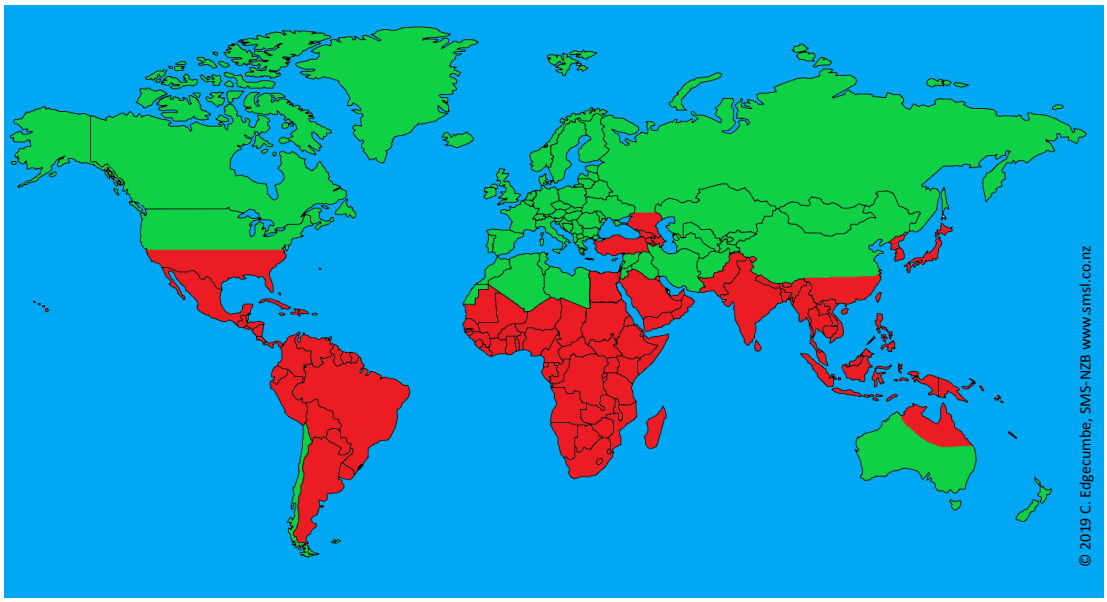
Laboratory studies have shown this species can transmit Chikungunya, Murray Valley encephalitis and Ross River virus efficiently and is considered a potential vector of these arboviruses (Lee *et al*., 1987, Vega-Rua *et al*., 2014). Studies have shown this species is a poor laboratory vector of dog

heartworm (*Dirofilaria immitis*) (Serrao *et al*., 2001) and it can also transmit Chandipura virus (Rhabdoviridae) (Mavale *et al*., 2005).

Aedes aegypti has been recorded with filarial infections of *Wuchereria bancrofti* and *Dirofilaria immitis* (Russell *et al*., 2005). It is also susceptible to infection and can transmit the avian parasite *Plasmodium gallinaceum* (Alavi *et al*., 2003). This species is also capable of mechanical transmission of lumpy skin disease virus (LSDV) to susceptible cattle (Chihota *et al*., 2001).

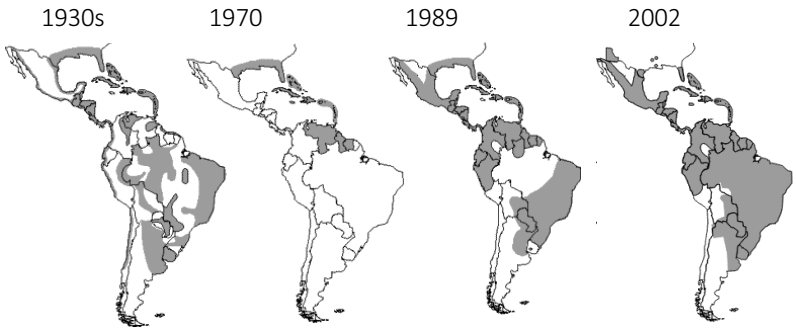
Geographic Distribution

Aedes aegypti is predominantly a coastal species on large continents, sometimes confined to ports, however, in Australia, United States and Brazil this species has spread inland (Lee *et al*., 1987). *Aedes aegypti* is widespread throughout the world, including Africa, Argentina, Australia, Brazil, Caribbean Islands, China, Cook Islands, Fiji, India, Hawaii, Japan, Malaysia, Morocco, New Caledonia, Papua New Guinea, Peru, Philippines, Portugal, Samoa, Seychelles, Surinam, Taiwan, Thailand, Vanuatu and southern U.S.A (Amarasinghe *et al*., 2011; Kraemer *et al*., 2015; Kamal *et al*., 2018).



This map denotes only the country or general areas where this species has been recorded, not actual distribution.

The distribution of *Ae. aegypti* changed over the years as a result of an eradication programme. In the Americas, because of the threat of outbreaks of urban yellow fever, a hemisphere widespread eradication campaign was started in 1947. Almost all of the countries of the hemisphere were able to eradicate *Ae. aegypti* except Venezuela and the USA, and these countries remained a source of reinfestation. Because of funding, technical and administrative problems, most countries were unable to sustain a high level of surveillance once the species had been eradicated from their territory. Reinfestations often escaped attention for some time and when discovered were frequently already widespread; as time went on, funding and national will were less and less available to attempt it again. By 1993 virtually every country in Latin America had become reinfested (Gratz, 1993).



Distribution of *Aedes aegypti* in the Americas. NB. 1970 was at the end of the mosquito eradication program (www.cdc.gov).

Incursions and Interceptions

Aedes aegypti larvae and adults has been intercepted in New Zealand on a number of occasions. The majority of these interceptions to date have been at the Auckland International Airport. See the table below for detailed information on each event.

Date	Origin of Transport	Location	Life stage	Circumstances
07/03/2018	Unknown	Ports of Auckland (POA)	1 Male	Found during enhanced surveillance in a Dominator trap at Ports of Auckland
29/12/2017	Unknown	Auckland International Airport (AIAL)	3 Larvae (3rd instar)	Found in a Tyre trap during enhanced surveillance
23/12/2017	Unknown	AIAL	1 Female	Found in a BG trap during enhanced surveillance
23/12/2017	Unknown	AIAL	2 Larvae (3rd instar)	Found in a Tyre trap during enhanced surveillance
22/12/2017	unknown	AIAL	1 Male	Found in a Dominator trap during enhanced surveillance
15/12/2017	Unknown	AIAL	5 Larvae (3rd instar)	Found in a Tyre trap in the arrivals area of ITB
17/08/2017	Unknown	AIAL	1 Female	Found in a Dominator trap during routine surveillance
15/01/2017	USA	AIAL	1 Male	Caught flying around MPI Risk Assessment Area, Desk 9
14/01/2017	Unknown	AIAL	1 Male	Caught flying around Risk Assessment area, Desk 11
13/01/2017	Unknown	AIAL	1 Female	Caught flying around Risk Assessment area, Desk 9
06/06/2016	Unknown	AIAL	1 Female	Caught flying around Risk Assessment area at MPI search bench
03/03/2016	Unknown	AIAL	1 Larvae (2nd instar) 1 Larvae (3rd instar)	Found in Tyre trap in Breezeway during routine surveillance.
20/02/2016	Unknown	AIAL	1 Female	Caught flying around unclaimed baggage area
28/12/2015	Japan	AIAL	1 Female	Caught flying around luggage inspection area
07/10/2015	Philippines	Mt Wellington, TF	1 Female	Found dead in container with pineapples
28/06/2015	Cambodia	AIAL	1 Female	Found in Luggage in arrivals area
31/03/2015	Unknown	AIAL	1 Female	Found Alive at baggage tracing unit
20/12/2014	Unknown	AIAL	1 Female	Found alive in lost baggage area
14/12/2011	Tonga	POA	11 Larvae (4th instar) 3 *Aedes polynesiensis* 2 Mosquito pupae	Found in used tyres on a truck from Tonga, Freyberg wharf, Shed 6
08/10/2010	Papua New Guinea	POA	2 Larvae (1st instar) 4 Larvae (2nd instar) 2 Larvae (3rd instar) 4 Larvae (4th instar)	Found in tyres on deck of ship

Date	Origin of Transport	Location	Life stage	Circumstances
29/04/2010	Papa New Guinea	Auckland, TF	1 Male (dead) *Culex quinquefasciatus*	Found in an Avondale, Auckland at a devanning site. In a container from Vietnam with ceramics
26/02/2009	Unknown	AIAL	1 Male	Found in arrivals area
07/01/2009	Suva, Fiji	Penrose, Auckland TF	1 Female	Found alive in a Taro shipment
11/11/2008	Vanuatu	POA	3 Larvae (4th instar) 5 pupae *Culex quinquefasciatus*	Found in used machinery on ship from Vanuatu
14/01/2007	Cook Islands	POA	7 Larvae (2nd instar)	Found in Cargo hatch covers in ship from Cook Islands
30/07/2005	Unknown	POA	1 Female	Flew into MAF quarantine vehicle
09/02/2005	Rarotonga	POA	6 Larvae (3rd/4th instar) 2 Larvae (2nd instar)	Found in a canoe on a trailer from Rarotonga
28/01/2004	Futuna (Wallis & Futuna Is)	POA	Larvae *Aedes polynesiensis*	Found in a Concrete mixer truck

Taxonomy

Aedes aegypti belongs to the *Scutellaris* group of subgenus *Stegomyia*. At least three morphologically distinguishable biotypes of this species are known (Christophers, 1960; Lee *et al*., 1987). *Aedes aegypti* is a small, dark mosquito with conspicuous white markings and banded legs, a black proboscis and white scaling on the tips of the palps. Adults and larvae may be confused with *Ae. notoscriptus* and *Ae. mallochi* (Russell, 1993).

Habits and Habitats

Aedes aegypti is a domestic container breeding species. It commonly breeds in water drums (Chadee and Rahaman, 2000), roof guttering (Montgomery and Ritchie, 2002), rain water tanks, pot plant saucers, tanks, tins, vases, tyres, subterranean waters and refuse filled by rain (Lee *et al*., 1987). This species will also breed in natural containers such tree holes and leaf axils of bromeliads (Lee *et al*., 1987; Forattini and Marques, 2000).

Aedes aegypti prefers to breed in rainwater with some organic matter, but this species can tolerate brackish and even chlorinated water (Lee *et al*., 1987). Eggs are laid on the inside of containers just above the water line (Lee *et al*., 1987) and are desiccation resistant (Cooling, 1924) for up to 1 year (Womack, 1993). Development time for each of the juvenile stages has been recorded for *Ae. aegypti* in Fiji during the months of September and October (mean temperatures of 23.6°C and 24.4°C respectively); eggs - 2 days, larvae - 11 days, pupae – 2 days, a total development period of 15 days (Lever, 1943 in Lee *et al.,* 1987).

In the USA, *Ae. aegypti* is active during the summer in northern states and active all year in the southern states (Womack, 1993). It does not overwinter in the egg stage in colder climates, but more southern populations remain reproductively active during winter and are periodically inactive during cold periods (Womack, 1993). Larvae have been recorded to die below 10°C, while adults do not survive well at temperatures below 5°C and are killed by temperatures below freezing (Womack, 1993).

Adults prefer urban and domestic breeding sites and are commonly found indoors (Lee *et al*., 1987). They tend to bite indoors (Lee *et al*., 1987), or in sheltered areas near housing. This species commonly bites during the day (Lee *et al*., 1987) and is especially active in the morning between 6-7am and late afternoon 5-6pm (Gillett *et al*., 1969). *Aedes aegypti* primarily bites humans, however it will feed on a wide range of species including birds and other mammals (Lee *et al*., 1987).

There are varying reports on the natural dispersal of *Aedes aegypti*. In field trials, Harrington *et al*. (2001) found the greatest distance *Ae. aegypti* flew was 79m, however Muir and Kay (1998) showed the mean distance travelled by recaptured females and males was 56m and 35m respectively. Results of a study of dispersal within and between rural communities demonstrated that *Ae. aegypti* generally disperses relatively short distances, although there were a few mosquitoes moving a maximum of 512m from one village to the next (Harrington *et al*., 2005). In a study in Brazil, rubidium (Rb) blood fed females of *Ae. aegypti* were released to track their dispersal (Honorio *et al.*, 2003). Rb-marked eggs were detected up to 800m from the release point, suggesting that females can fly at least 800m within 6 days (Honorio *et al.*, 2003).

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