



NEW ZEALAND BIOSECURE

Entomology Laboratory



Aedes (Finlaya) japonicus (Theobald)

Japanese rock pool or Asian bush mosquito

NZ Status: Not Present – Unwanted organism



photo by Mike Sardalis, USAMRIID

Vector and Pest Status

Aedes japonicus is a known vector of Japanese encephalitis (Sucharit *et al.*, 1989) and can also transmit St. Louis encephalitis (Sardelis *et al.*, 2003), Eastern Equine encephalitis (Sardelis *et al.*, 2002b) and La Crosse virus (Sardelis *et al.*, 2002a) chikungunya and dengue virus (Schaffner *et al.*, 2011) in the laboratory it has also been found to be a vector for Zika virus in the laboratory, though it has a low vector competence (Jansen *et al.* 2018). It is a highly efficient laboratory vector of West Nile virus and wild specimens have been found containing this virus (Turell *et al.*, 2001a; 2001b; Sardelis and Turell, 2001). *Ae. japonicus* is also susceptible to infection with Getah virus (Takashima and Hashimoto, 1985).

Geographic Distribution

Aedes japonicus is widespread throughout Asia and is found in Japan, Korea, the Ryukyu Archipelago (Okinawa and associated islands), Taiwan, South China, and Hong Kong as well as southeast Russia.

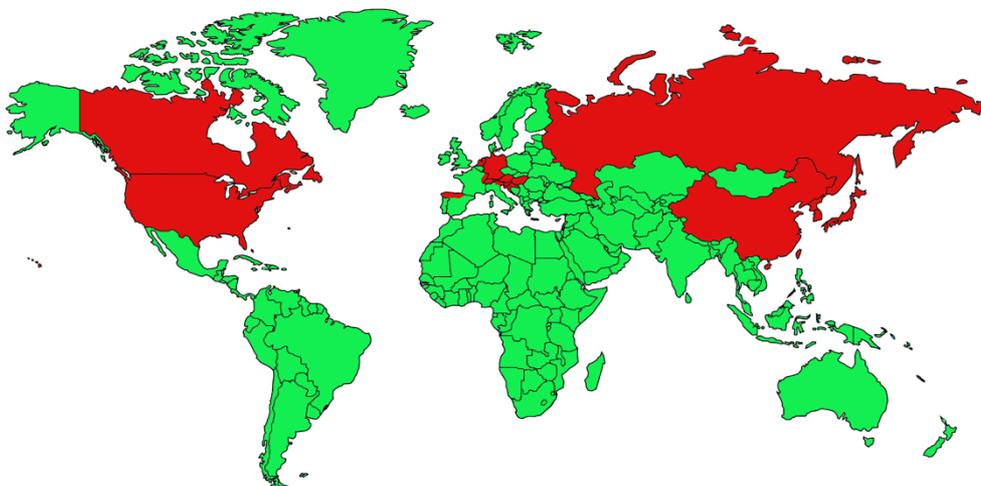
In 2000, larvae of *Ae. japonicus* were discovered in a village in north western France in recycled tyres from the USA and Japan (Schaffner *et al.*, 2003). Larval stages found in the area indicate that this species was reproducing locally (Schaffner *et al.*, 2003). European populations were subsequently eradicated however a new population was discovered in 2013 which had spread into France from Switzerland and Germany (Koban *et al.*, 2019). A population was also found in Belgium in 2002, then another in 2008, both in tyre-trading companies.

The subspecies *Ae. japonicus japonicus* was found in New York and New Jersey, the United States in 1998, and spread to 19 states and Quebec, Canada by the end of 2003 (Peyton *et al.*, 1999; Savignac *et al.*, 2002; Thielman and Hunter, 2006). It has been suggested that the method for this species may be via the international transport of used tyres (Peyton *et al.*, 1999; Thielman and Hunter, 2006). In 2003, *Ae. japonicus japonicus* was also found on the island of Hawaii, it is the 8th exotic species to become established in that state (Larish and Savage, 2005).

In 2008, a population was found breeding on the border of northern Switzerland and southwest Germany with the source of the introduction unable to be identified (Koban *et al.*, 2019). This population has since spread further into Germany and Switzerland, as well as through Liechtenstein and western Austria. A second population also covers south-eastern Austria and Slovenia, parts of Hungary and Croatia, and northern Italy (Koban *et al.*, 2019).

A small population also exists in the Netherlands, which is currently restricted to the municipality of Lelystad. Other small populations exist throughout northern Germany, and genetic makeups show they are possibly from a separate introduction event, as they are closer related to the population in the Netherlands than those of southern Germany and Switzerland (Koban *et al.*, 2019).

In 2018, populations of *Aedes japonicus* were found in northern Spain through an alert from a citizen science program (Eritja *et al.*, 2019) and Luxembourg (Koban *et al.*, 2019).



Red represents countries where populations of *Aedes japonicus* is present, and green are countries where the species is not present.

Incursions and Interceptions

Aedes japonicus has been intercepted in New Zealand on ten occasions since 1993. The specimens were collected from a water tanker, used tyres (Laird *et al.*, 2004), and used machinery, all offloaded from ships originating from Japan (Derraik, 2004; NZ BioSecure, unpublished data, 2007).

Taxonomy

Aedes japonicus belongs to the subgenus *Finlaya* and contains several morphologically similar subspecies. Tanaka *et al.*, (1979) describes the four subspecies that occur throughout most of Japan, Taiwan, Korea, eastern China. They are:

Aedes japonicus japonicus – Palaearctic Japan and Korea

Aedes japonicus yaeyamensis – Ryukyu Archipelago

Aedes japonicus amamiensis - Ryukyu Archipelago

Aedes japonicus shintiensis - Taiwan

Habits and Habitat

Aedes japonicus is a container breeding species which breeds in natural containers such as tree holes, leaf axils, bamboo stems and rock holes, as well as artificial containers such as tins, tyres, drums, water tanks, vases, bird baths and roof gutters (Kano *et al.*, 1954; Tanaka *et al.*, 1979; Andreadis *et al.*, 2001; Scott *et al.*, 2001). It has also been collected from subterranean catch basins, surface water rain pools and spring fed depressions (Andreadis *et al.*, 2001) Rock holes appear to be the most favoured immature habitat (Tanaka *et al.*, 1979). This species usually prefers shaded breeding areas and water rich in organic matter (Tanaka *et al.*, 1979), and is commonly encountered breeding with other species such as *Aedes atropalpus* in the USA (Andreadis *et al.*, 2001).

Females of this species lay their eggs just above the water line. The eggs are desiccation resistant and may survive for several months in dry conditions. A study of oviposition activity of the subspecies *Ae. j. japonicus* in the field found that egg laying occurred at sunrise and sunset (Scott, 2003). Tanaka *et al.* (1979) indicated a preference by larvae for shaded locations, however they have also been observed in containers in sunlit areas in the USA, Japan and Korea (Andreadis *et al.*, 2001 and references there in).

Tanaka *et al.* (1979) suggested *Ae. japonicus* has adapted to colder conditions and is capable of surviving snowy winters. This species overwinters as eggs in north eastern Japan and larvae in south western Japan (Kamimura, 1976 in Tanaka *et al.*, 1979). In the USA (Connecticut) this species is multivoltine (Andreadis *et al.*, 2001), as it is in Japan (Iriarte *et al.*, 1991). Its presence in Connecticut from late May to early November further indicates that this species is cold tolerant under these climatic conditions (Andreadis *et al.*, 2001). Larvae have been found developing at temperatures as low as 4°C and have been found at altitudes up to 1500m in the USA where temperatures can drop to -18°C (Kampen and Werner, 2014). Collections from ashtrays and very dirty tire water in Canada suggest that the larvae are also very tolerant to pollutants in the larval sites (Thielman and Hunter, 2006).

Dispersal of adults depends on the availability of habitat usually within 30-300m from the emergence site. They will disperse further if there is no suitable habitat nearby.

Adults live in forested areas and are day biters (Tanaka *et al.* 1979). Females feed on an array of species including humans, pigs, dogs, chickens, deer and rodents (Scott, 2003). In their native habitat, *Aedes japonicus* were originally recorded as being reluctant to bite humans (Tanaka *et al.*, 1979). However, Iriarte *et al.* (1991) found that they were the most prominent species collected during a human bait trial in multiple sites near Nagasaki City in Japan. Andreadis *et al.*, (2001) found *Aedes japonicus* were readily caught using human bait in Connecticut, USA. In the laboratory they have been observed to feed on chickens and mice, but not on reptiles or amphibians (Miyagi, 1972).

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