Exotic Mosquitoes Established In New Zealand

HIGHLIGHTS:

- **No new exotic mosquitoes were introduced to New Zealand between 2006 and 2015.**
- **As of 2015, there are three long-established exotic mosquito species in New Zealand.**
- **The Southern Saltmarsh Mosquito (*Aedes camptorhyncus*) - first reported to be living in New Zealand in 1998 - was eradicated in 2010.**

Exotic mosquitoes can be bad for our health

Aedes mosquito. Source: Centers for Disease Control and Prevention

Exotic mosquitoes can spread mosquito-borne diseases between humans (e.g. Dengue Fever, Malaria) by biting infected people and then biting susceptible others. These diseases are a major cause of illness and death overseas. International travel and climate change enable exotic mosquitoes to inhabit new territories. Mosquito-borne diseases are spreading globally, including to the Pacific where the warm, wet and humid climate is favourable for exotic mosquitoes.

The introduction of high-risk exotic mosquitoes to New Zealand's environment would increase the risk of mosquito-borne disease outbreaks occurring here. New Zealand's native mosquitoes tend to bite birds and are considered less likely to spread serious diseases to humans. Different types of exotic mosquitoes have varied abilities to spread different diseases. Monitoring the types and distribution of exotic mosquitoes which have been introduced to New Zealand is, therefore, important.

No new exotic mosquito species were introduced to New Zealand, 2006-2015

No new mosquito species were introduced, 2006-2015. Four pre-existing exotic species were present (Table 1) (NZ BioSecure 2016).

Table 1: New Zealand's recent history of exotic mosquito introductions

Exotic mosquito species known to have established in New Zealand	Time period (Year-Year)	New Zealand distribution
Aedes australis	1961 - present	Southern South Island
Aedes notoscriptus	1916 - present	North Island and South Island from Lyttelton north
Culex quinquefasciatus	1830 - present	North Island and northern South Island
Southern Saltmarsh Mosquito (*Aedes camptorhyncus*)	1998 - 2010 *Eradicated*	North and eastern North Island and northern South Island

Source: NZ BioSecure 2016

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What happened recently?

The eradication of the Southern Saltmarsh Mosquito (*Aedes camptorhyncus*) in 2010 has been the most important change to New Zealand's mosquito profile in recent years (Table 1). New Zealand has an ongoing saltmarsh mosquito surveillance programme as a result of this mosquito's previous establishment.

While remaining exotic introduced species in New Zealand have the potential to carry mosquito-borne diseases (e.g. *Culex quinquefasciatus* can spread diseases such as Japanese Encephalitis), the absence of locally-acquired mosquito-borne disease outbreaks in New Zealand suggests that they are not high-risk vectors of these diseases at present (Kramer et al 2011).

Climate change will make New Zealand more vulnerable to mosquito-borne diseases

Climate change is likely to make New Zealand's environment increasingly favourable for the survival and spread of mosquito species and mosquito-borne diseases (Tompkins et al 2012). Environmental factors which determine how well mosquito-borne diseases spread include (Weinstein et al 1997; Kramer et al 2011):

The presence of particular mosquito species

Specific high-risk species are efficient at spreading different diseases

Climate and geography

For example, temperature, rainfall, humidity, vegetation and water can determine whether mosquitoes survive long enough to:

- Reproduce
- Bite an infected human
- Incubate the disease before biting someone else

Disease characteristics

Some disease agents (viruses, bacteria, parasites) are faster at incubating within mosquitoes, and are therefore more readily spread. A warmer New Zealand climate could also increase the ability of mosquitoes already established in New Zealand to spread diseases, by shortening incubation times.

Human population density

- How closely people live together, and
- the extent of mosquito prevention measures nearby (e.g. insecticide sprays, mosquito nets).

Mapping the distribution of New Zealand's changing environment (e.g. climate, population distribution), for suitability for mosquito establishment and mosquito-borne disease transmission, is complex.

Different combinations of environmental factors have variable effects on different mosquito species and different disease agents. Data modelling is also necessary to address data uncertainties. A few New Zealand projects have modelled the potential distribution of specific mosquito-borne diseases under different environmental conditions (De Wet et al 2005; Tompkins et al 2012). In general, Auckland and Northland regions in the Northern North Island have the greatest outbreak potential. Maps of potential Dengue Fever and Ross River Virus distributions in New Zealand (published in 2011) can be explored online here (Tompkins et al 2012):

http://haifa.esr.cri.nz/modelling-and-map-portal/

References

De Wet N, Slaney D, Ye W, Warrick R, Hales S. 2005. *Hotspots: Modelling capacity for vector-borne disease risk analysis in New Zealand.* Waikato: International Global Change Institute, and Wellington: Ecology and Health Research Centre.

Kramer LD, Chin P, Cane RP, Kauffman EB, Mackereth G. 2011. Vector Competence of New Zealand Mosquitoes for Selected Arboviruses. *Am J Trop Med Hyg* 85(1): 182 – 9.

New Zealand BioSecure Entomology Laboratory (NZ BioSecure). 2016. *New Zealand Mosquitoes.* Southern Monitoring Services Limited. URL: www.smsl.co.nz (accessed June 2016).

Tompkins D, Brock A, Jones G, McBride G, Tait A, Benschop J, et al. 2012. *Modelling the Impacts of Climate Change on Infectious Diseases in New Zealand*. Porirua: Institute of Environmental Science and Research Limited.

Weinstein P, Laird M, Browne G. 1997. *Exotic and endemic mosquitoes in New Zealand as potential arbovirus vectors*. Wellington: Ministry of Health New Zealand.

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