New Zealand BioSecure

BORDER HEALTH NEWSLETTER

JANUARY 2025

NAU MAI, HAERE MAI - WELCOME!

Kia ora koutou katoa,

We hope everyone has had a good summer so far! A warm welcome back to Mariana who is back in the lab part time after being on maternity leave. We are very excited to have her back in the lab!

In the news this month, let's celebrate Georgia's new malaria-free status! Discover how female fruit flies (and potentially mosquitoes) tuned their antennae of the frequency of male's flapping wings or how to use entomopathogenic fungi as a potential control method against malaria vectors. Finally, learn more about how Zika virus and Semliki Forest virus could lead to medical breakthroughs.

Finally, test your mosquito identification skills and see if you can spot the real mosquito among a bunch of AI generated mosquitoes.

Happy reading!

SURVEILLANCE

During January a total of 1159 routine and enhanced surveillance, and various survey samples were collected by staff from 12 PHUs (Figure 1). The samples included 184 positive larval samples and 120 positive adult samples, leading to a total of 12827 larvae and 394 adults identified over the past month (Table 1).

Culex quinquefasciatus is the dominant larval species this month, which is the same as this month last year and last month (Table 1)

Table 1. Adult and larvae sampled by the New Zealand surveillance program during January 2024 & 2025

Species (common name)	Adults		Larvae	
	Jan 25	Jan 24	Jan 25	Jan 24
Aedes antipodeus (winter mosquito)	12	1	-	-
Ae australis (saltwater mosquito)	-	-	-	107
Ae notoscriptus (striped mosquito)	22	140	4290	5394
Coquillettidia iracunda (no common name)	1	-	-	-
Coq tenuipalpis (no common name)	1	-	-	-
Culex asteliae (no common name)	-	-	2	-
Cx pervigilans (vigilant mosquito)	41	41	1907	3426
Cx quinquefasciatus (southern house mosquito)	300	557	6505	14411
Culex sp.	17	35	-	-
Opifex fuscus (rock pool mosquito)	-	-	123	161
Total	**394**	**774**	**12827**	**23499**

In total, eight mosquito species have been collected this month (Table 1), that is three more than last month.

Compared to the previous month, the total numbers of larvae have shown a decrease (28%) while adults have shown an increase (70%).

Compared to this same month last year, the total numbers of larvae and adults have shown a decrease (45% and 49% respectively) (Table 1).

The highest number of larvae sampled this month was obtained in Northland (4938 larvae) followed by Bay of Plenty (2348 larvae) (Figure 1).

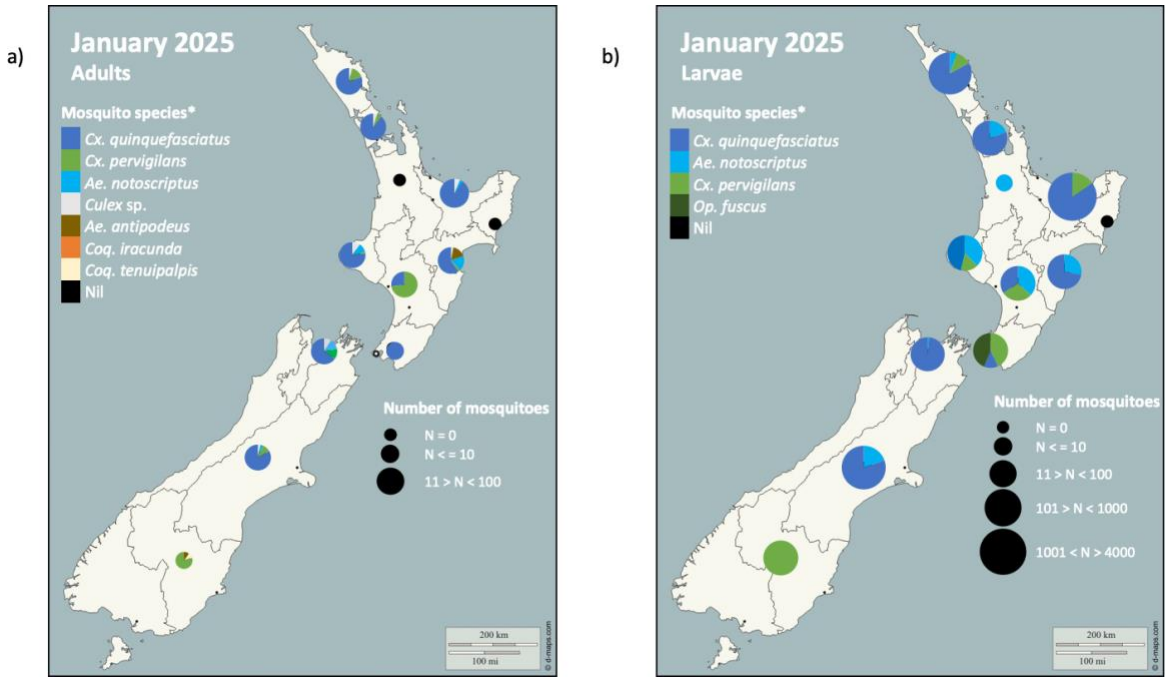


Figure 1. Total mosquito adults (a) and larvae (b) sampled in New Zealand during January 2025 surveillance period. Please note that the markers represent the PHUs and not the specific sites where the samples have been taken.
* The mosquito species are listed in order from the most abundant to the least abundant.

Aedes notoscriptus larval numbers have shown an increase in four PHUs, a decrease in six, and remained absent in two compared to the same month last year (Figure 2).

As expected, *Aedes notoscriptus* has not been recorded this month, this year, or last year in Southland (Figure 2).

Culex quinquefasciatus larval numbers have shown an increase in six PHUs, a decrease in four PHU, and remained absent in two compared to the same month last year (Figure 2).

As expected, *Culex quinquefasciatus* larvae have not been recorded this year in Southland (Figures 1 and 2).

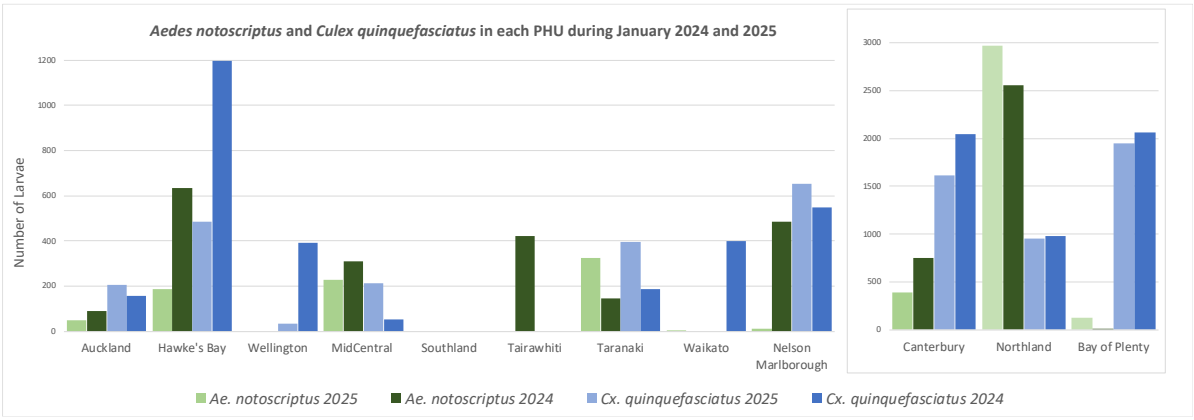


Figure 2. Comparison between introduced mosquito species sampled in each PHU during January 2024 and 2025. *Please note the different scale for the number of larvae present in Northland, Canterbury, and Bay of Plenty in comparison to the other PHUs.

INCURSIONS AND INTERCEPTIONS

During January, HPOs responded to five suspected interceptions, including the detection of one locally occurring species, and two non-mosquitoes and the interception of two unwanted mosquitoes (Table 2).

Table 2. Suspected interception during January 2025

Date	Species	Location	Circumstances
8.01.2025	1 Female *Culex pipiens pallens*	Ports of Auckland	Found dead in a vehicle being transported from Japan. Before boarded, Vehicles were heat treated. Whilst on board, vehicles were kept in a vehicle only freezer with the windows wound down.
12.01.2025	1 Female *Culex quinquefasciatus*	Transitional Facility Mainfreight, Mangere, Auckland	Found live in air can transporting taros from Fiji. The air can was stored in 5-6°C chiller since arrival to NZ.
14.01.2025	1 Non-mosquito (Chironomidae)	Ports of Auckland	Found dead in a vehicle from Japan. Vehicle was heat treated and cleaned in Japan before loading and fogging during voyage from Japan to NZ. No other dead or alive organisms were found in the vehicle. All windows were closed pre inspection.
16.01.2025	Non-mosquitoes (Chironomidae Syrphidae)	Auckland International Airport	Larvae and pupae found alive in pooling water near construction on landside at the eastern cart dock loading area. Treated with Bti as unable to eliminate prior to being back filled.
10.01.2025	1 Female *Culex gelidus*	Ports of Auckland	Found dead in a vehicle from Thailand. Vehicles had windows all closed. 70 out of 726 vehicles inspected and only 1 vehicle with a positive mosquito finding. Vehicles were not treated but were cleaned.

NEWS ARTICLES FROM AROUND THE WORLD

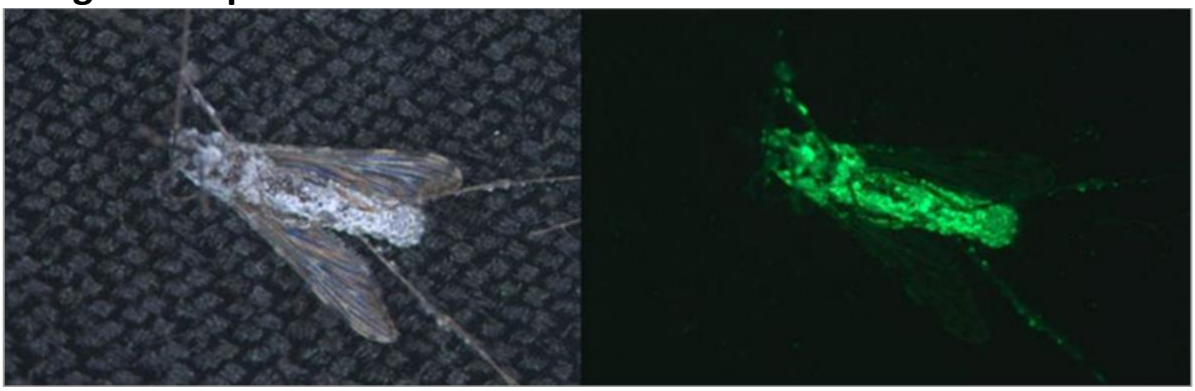
World Health Organization (WHO) certifies Georgia as Malaria free

After decades of targeted and sustained actions to eliminate malaria, Georgia has been declared malaria-free by WHO, giving hope for a malaria-free world. Georgia joins the rank of the 45 countries and one territory that have already achieved this milestone. With at least three malaria parasite species being endemic (*Plasmodium falciparum, P. malariae* and *P. vivax*), Georgia's effort started in the early 1900s with intensive programmes that yielded success in the 70'. However, a resurgence of the disease in 2002, pushed Georgia to renew its commitment to stop the malaria and signing the Tashkent Declaration to pledge to eliminate the disease. Read more about the history of Georgia's fight against malaria here, or here. Discover the list of WHO certified malaria-free countries and territories here.

How fruit-fly genetics could change the fight against mosquito-borne diseases

Researcher in the University of Iowa studied how female fruit flies hear prospective males via their antennae. Within the fly's Johnston's organ, a potassium ion channel translates outside sounds into electrical signals that can be interpretated by the fly as courtship songs. The team found a specific gene that could be involved in the ability to tune to the unique frequency of a male flapping wings and therefore increase the chance of the female mating. This gene, also present in mosquitoes, could be silenced and prevent the tuning to happen, lowering the ability of females to find mates. However, more research needs to be done before this discovery becomes a technology available to help control mosquito populations. Read more about the topic here, or read the full scientific article here.

Mosquito-killing genetically engineered fungi as a new technology to fight the spread of malaria



Researchers from Burkina Faso and the United States designed genetically modified fungi (*Metarhizium* spp.) which spores express an insect-specific neurotoxin that male mosquitoes transfer to female while mating. This technology aims to target both indoor and outdoor insecticide-resistant populations of mosquitoes, improving the array of methods available for malaria vector control. *Metarhizium* spp exist in the wild and these entomopathogenic fungi directly attack the cuticle and penetrate the insect body through the exoskeleton. The lab and semi-field results are promising but transmission decrease after 24 hours post-treatment and depends on mating behaviours. These results highlighted the potential of transgenic fungi to serve as an effective tool for mosquito control, especially when integrated with other strategies. Furthermore, the study underscores the need for preliminary field evaluations of mating site characteristics to maximize transmission efficiency in real-world conditions. Read more about this new technology here or discover the full scientific article here.

Understanding of how Zika virus hijack its host protein production to replicate open new medical opportunities

Zika virus, like other viruses, carries only a limited set of instructions in its own genetic material, and relies on taking over host cell proteins and functions to reproduce. Our cells are well equipped to fight off these viruses, but only if they can find them so Zika and related viruses have evolved strategies to hide. A recent study showed that a viral protein NS4A interacts with a host protein ANKLE2 involved in cell division and brain development. In Zika-infected cells, ANKLE2 clusters in pockets and those pockets acts as virus factories while efficiently hiding the virus form the immune system. As Zika virus hijack ANKLE2 in mosquitoes and that NS4A/ANKLE2 interaction is important for replication across a broad

group of mosquito-borne viruses including dengue virus and yellow fever virus, this discovery opens possible routes to new drugs and vaccines for these diseases. Read more about NS4A/ANKLE2 and Zika here and the scientific article here.

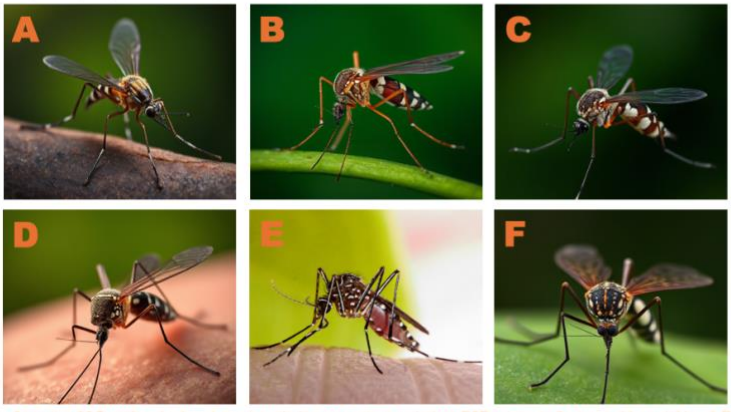
Discovery of Semliki Forest virus' pathway to brain provides potential new treatment for brain cancer

Semliki Forest Virus (SFV) is a type of alphavirus isolated from the Semliki Forest in central, eastern, and southern Africa. The pathway in which this virus enters the brain has been a mystery. However, recent studies have identified that a receptor called the Very Low-Density Lipoprotein Receptor (VLDLR) as the primary receptor for Semliki Forest virus when entering host cells. SFV is also known as a type of Oncolytic virus, which are used as an immunotherapy against cancer, where the virus both invades and kills cancer cells, and activates the immune system to attack the tumour. Through DNA sequencing, the neurovirulence of SFV can be reduced while retaining oncolytic properties. Although this research is still in development, the potential for a new treatment for brain cancer is exciting. Read more on VLDLR here. Read more on SFV oncolytic treatment here.

KNOW YOUR (NOT AI) MOSQUITO

GAME - A.I. generated mosquitoes

Five of these pictures were A.I. generated* by using the prompt "photorealistic mosquito". With the help of *Fig. A*, can you guess which one is the real mosquito? For the others, can you see what is wrong with them?
The increase in the use of A.I. generated pictures could lead to misinformation, so it is worthy to be aware that they exist and how to spot them.
*https://deepai.org/machine-learning-model/text2img



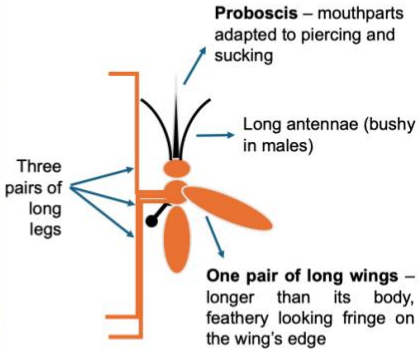


Fig. A – Key features of an adult mosquito

Answers: A&C, proboscis absent, one leg missing, one antenna missing; B&D, wings on the same side, weird head; E, female Aedes notoscriptus with her distinctive white line on her femur; F, weird legs, proboscis looks like a leg.

RISK MAPS

Dengue Map – Centres for Disease Control and Prevention
Zika Map – Centres for Disease Control and Prevention
Malaria – Centres for Disease Control and Prevention
Malaria – World Health Organisation

DISEASE OUTBREAKS

To find out where the latest disease outbreaks have occurred visit:

Epidemic and emerging disease alerts in the Pacific region - Produced by the Pacific Community (SPC) for the Pacific Public Health Surveillance Network (PPHSN).

Disease Outbreak News - World Health Organization.

Public Health Surveillance - Institute of Environmental Science and Research (ESR) - Information for New Zealand Public Health Action.

Communicable disease threats report - European Centre for Disease Prevention and Control