NEW ZEALAND BIOSECURE

BORDER HEALTH NEWSLETTER – OCTOBER 2021

WELCOME!

Kia Ora Koutou,

Thank you to all forty-nine people, including eight presenters and three organisers that participated in the first **Mosquito Workshop – Monitoring and Risk Assessment Tools**, organised by NZB and Te Papa, supported by MoH. We are sorry that many HPOs were on COVID response duties and where not able to attend. However, fear not we've got you covered! All sessions were recorded, and the videos will be available at a future date on request.

From top left to right: Magdalena Laurito, Lora Peacock, Andrew Van Den Hurk, Emiliano Fumagalli , Andrew Rae (Andy), Mariana Musicante, Tom Swan, Julia Kasper, Monica Singe, Denise Barnfather, Darryl McGinn, Davide Santoro, Andrés Visintin, Sherly George, Allison Graham, Neil Silver, Rochelle Knox, Mary Paul, Carolyn Edgecumbe, Rachel Cane, Gemma Cotton and Murray Fea.

In the news this month read about; the first factory mass-producing sterile males, and the use of this same technique to try to control mosquito transmitters of avian malaria in Hawai'i, and how scientists managed to genetically modify *Aedes aegypti* to reduce their offspring numbers. Also, about the finding of a new antibody which may be associated with the prevention of malaria. And, read about how some predictive models may need to be readjusted to understand the impact of climate change on disease vectors, and how the changes on weather patterns are helping the invasive *Aedes koreicus* spread around Europe.

Don't forget to check the *Know Your Mosquito* section to learn more about the anthropophilic and cold-tolerant mosquito species *Aedes koreicus.* Also, check the *Know Your Mosquito Trap* and learn some tips from the experts on how to process Tyre Traps and why these traps are so attractive to mosquitoes. Finally, have a laugh with the Bite of Humour section. Scroll down and enjoy!

Happy reading!

SURVEILLANCE

During October, 974 routine samples were collected by staff from 10 DHBs (Figure 1). The samples included 62 positive larval samples and 4 positive adult samples, leading to a total of 8 adults and 1812 larvae identified over the past month (Table 1). As is common over the cooler months, *Aedes notoscriptus* is the dominant larval species (Table 1).

In total, five mosquito species have been collected this month (Table 1), one more than collected last month.

Compared to this same month last year, the total number of larvae and adults have shown a 60% and 53% decrease respectively (Table 1).

Table 1. Adult and larvae sampled by the New Zealand surveillance program during October 2020 & 2021

Species (common name)	Adults		Larvae	
	Oct 21	Oct 20	Oct 21	Oct 20
Ae antipodeus (winter mosquito)	1	8	-	-
Ae notoscriptus (striped mosquito)	2	1	1329	2214
Cx pervigilans (vigilant mosquito)	4	4	356	1655
Cx quinquefasciatus (southern house mosquito)	1	3	119	685
Culex sp.	-	1	-	-
Opifex fuscus (rock pool mosquito)	-	-	8	15
Total	**8**	**17**	**1812**	**4569**

Compared to last month, mosquito larval and adult numbers have shown an 8% and 33% increase respectively.

The highest number of larvae sampled this month was obtained in Northland DHB (1438 larvae) followed Public Health South (189 larvae) (Figure 1).

Aedes notoscriptus larval numbers have shown a decrease in 7 DHBs from this same month last year (Figure 2). As expected, *Aedes notoscriptus* has not been recorded this month, this year, or last year in Public Health South (Figure 2).

Culex quinquefasciatus larval numbers have shown a decrease in two DHBs from this same month last year, and an increase in two DHBs. *Culex quinquefasciatus* has not been found this month in Public Health South (Figure 2).

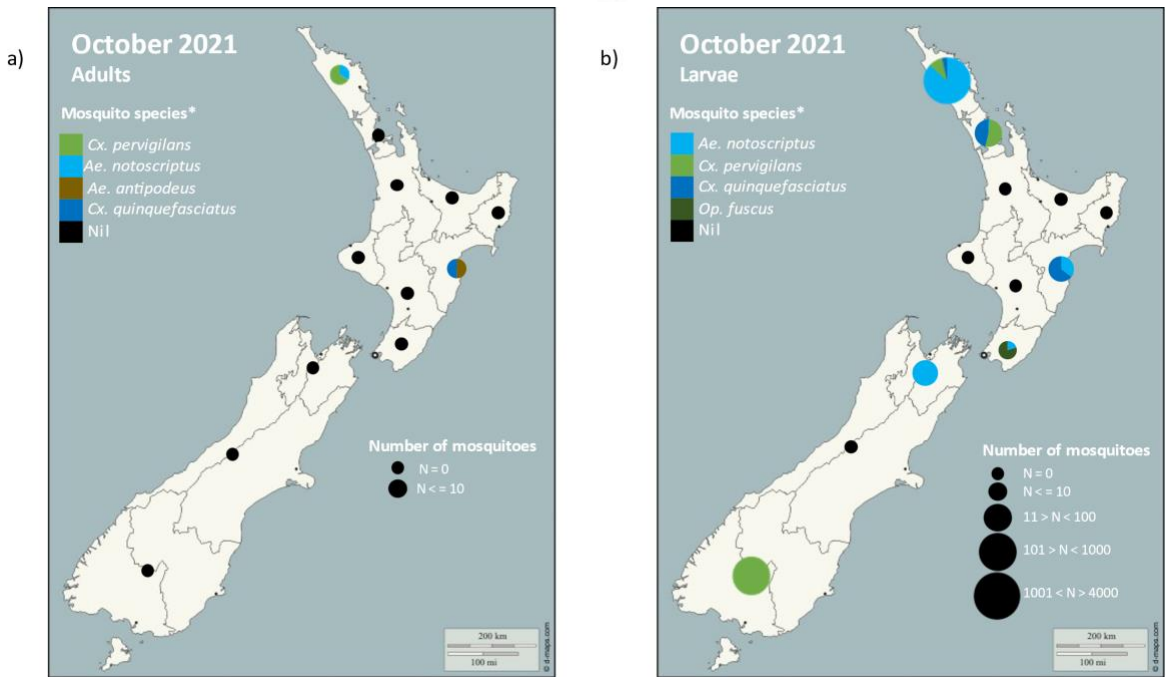


Figure 1. Total mosquito adults (a) and larvae (b) sampled in New Zealand during the October 2021 surveillance period. Please note that the markers represent the DHBs and not the specific sites where the samples have been taken.
* The mosquito species are listed in order from the most abundant to the least abundant.

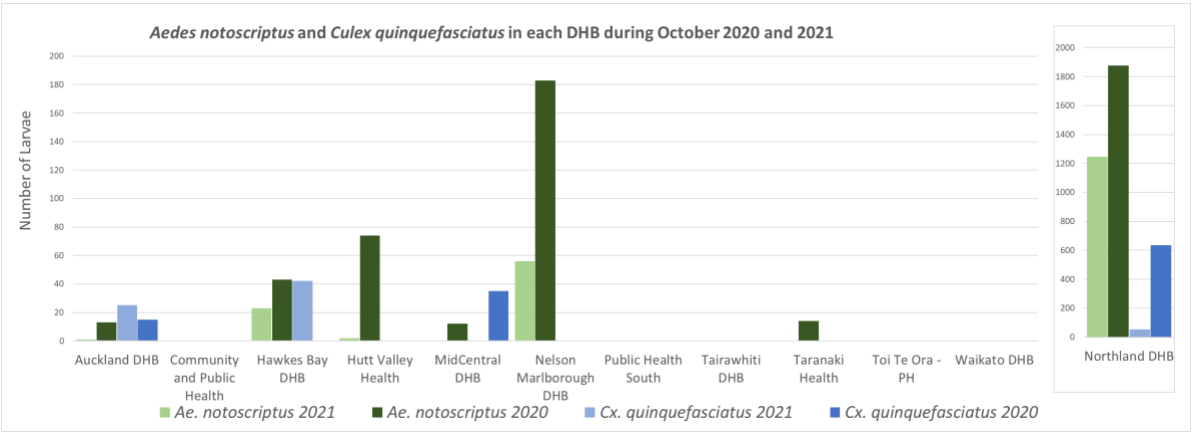


Figure 2. Comparison between introduced mosquito species sampled in each DHB during October 2020 and 2021.
*Please note the different scale for the number of larvae present in Northland DHB in comparison to the other DHBs.

Disclaimer: Note that all comparisons made have not been statistically tested and can be due to sampling effort.

INCURSIONS AND INTERCEPTIONS

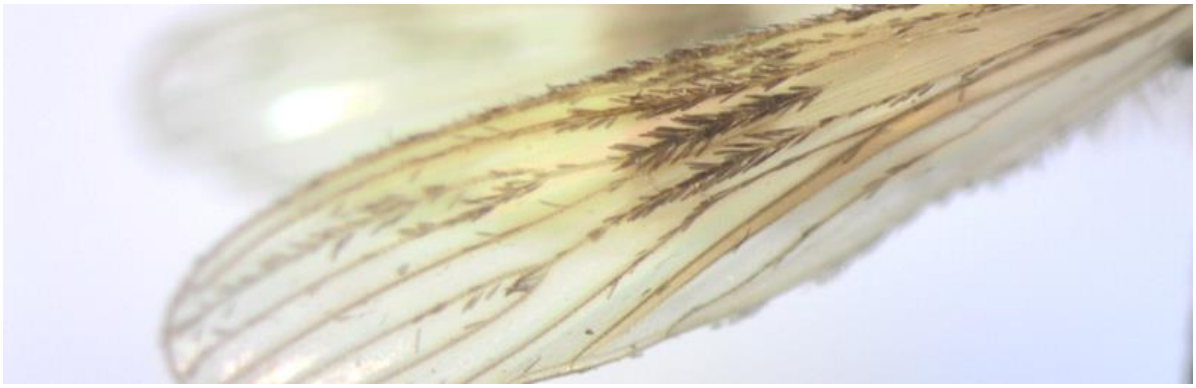
During October, HPOs responded to three suspected interceptions. One event involved a non-mosquito, and two events of locally occurring species from exotic origins (highlighted green in Table 2).

Table 2. Suspected interceptions during October 2021.

Date	Species	Location	Circumstances
12.10.2021	1 non-mosquito (*Chironomidae*)	UB Freight, Mangere, Auckland	A chironomid flew out from plant material being used as packaging for machinery from Mumbai, India. The insect was sprayed and collected by MPI and the boxes were treated as there were other contaminates found.
27.10.2021	1 Male *Culex* (*Culex*) *quinquefasciatus*	Sorted Logistics, Hornby, Christchurch	A mosquito was found dead in container of clothing from Indonesia, which had travelled to New Zealand via Singapore.
29.10.2021	50 Male *Culex* (*Culex*) *quinquefasciatus* 5 Female *Culex* (*Culex*) *quinquefasciatus* 1 Female *Culex* (*Culex*) sp. 1 unidentifiable mosquito (thorax only)	Simple Freight Services, Mangere, Auckland	57 dead mosquitoes and one possible live mealy bug were found during quarantine inspection of cartons of fresh mangos transported by AirNZ from Brisbane to Auckland.

NEWS ARTICLES FROM AROUND THE WORLD

Size is key to understanding the impact of climate change on disease vectors



A new international study has found that models of disease vectors, such as mosquitoes, are likely to overestimate the effects of future climate due to models traditionally relying on the relationship between wing length and reproductive output. Most models of mosquito distributions assume that there is a directly proportional relationship between wing length and reproductive output, or in other words, wing length and reproductive output increase at the same rate. However, the new research has challenged this assumption and found that the relationship is not linear - larger female mosquitoes contributed disproportionately more to the replenishment of the population. When factoring this in, they also found that smaller females were contributing more to population replenishment than was assumed in current models, and note that increasing temperatures result in smaller females. The authors concluded that to predict the response of disease vectors like mosquitoes to global change we need to better represent the relationship between size and reproductive output. Read more. Access the original article.

Postdoctoral fellow works to save endangered Hawaiian birds from mosquito menace

As the climate warms, disease-transmitting mosquitoes are invading the last strongholds for native birds in Hawai'i's upper elevation forests, which were once too cool for mosquito or avian malaria development. Dr. Katherine McClure is working to save Hawai'i's native bird populations from avian malaria, specifically the Hawaiian honeycreepers. "Because of the warming climate… the invasive southern house mosquito [*Culex quinquefasciatus*] is spreading farther into the habitat of these highly endangered birds." McClure is working with a multi-agency consortium called 'Birds, Not Mosquitoes' to advance the incompatible insect technique (IIT) program in Hawai'i and using *Wolbachia* to suppress mosquito populations in native forest bird habitats. Read more.

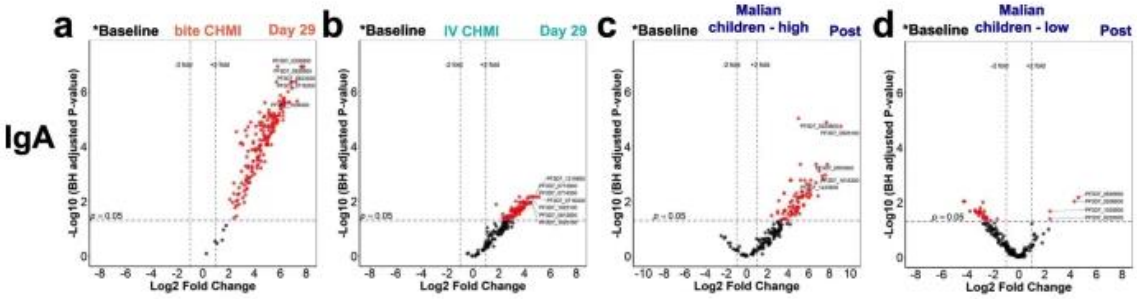
Altering hormones in *Aedes aegypti* to decrease their reproductive fitness

FIU Biomolecular Sciences Institute researchers collaborated with an international team to study juvenile hormone, a molecule that regulates development, reproduction and behaviour in insects. They produced genetically modified *Aedes aegypti* mosquitoes that cannot make juvenile hormone. The mutants could still mate and produce offspring - just not as many as their juvenile hormone-producing counterparts. The researchers say greater understanding of hormone action could unleash a new generation of mosquito control tools. Read more. Original paper.

A factory that makes mosquitoes - video tour through the lab that uses robots, AI, and Silicon Valley funding to create a "Marvellous Male Mosquito-Making Machine"

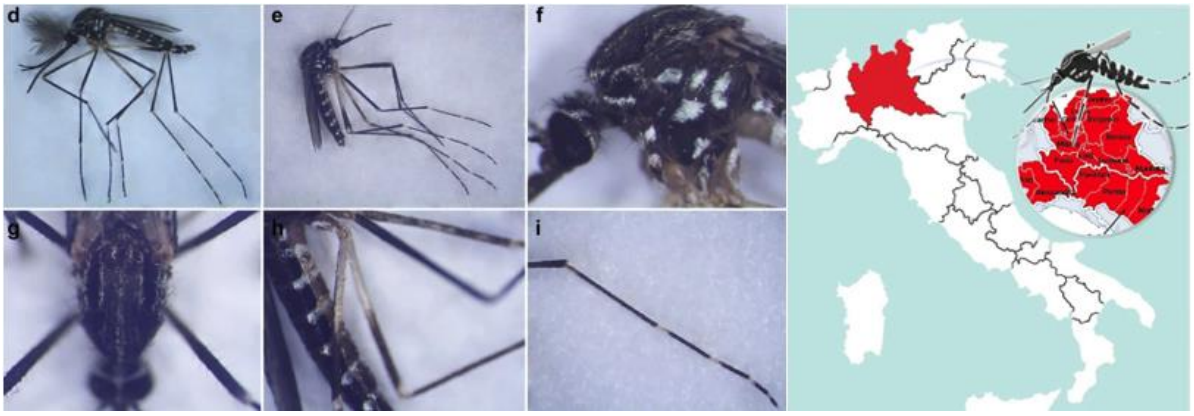
After nine years at Google working on the Chrome web browser, Linus Upson wanted a bigger challenge – pairing machine learning technology with the *Wolbachia* to tackle *Aedes aegypti* in Fresno, California. Verily, a Google sister company, has provided funding for the Debug project to create a larval rearing robot to breed *Wolbachia* infected male mosquitoes, which are sterile when breeding with wild non-*Wolbachia* infected females. The automated system feeds, stores, and raises the larvae into adults which are then sorted into males and females using accurate cameras with machine learning so that the males can be released into the community and drive down the wild populations. Read more. Learn about the project.

Unexpected antibody type found in people with malaria infections



Malaria is typically thought of as a blood and liver infection. However, in a newly published study, researchers at the University of Maryland School of Medicine (UMSOM) have detected antibodies primarily made in response to infections in the mucous membranes -- in such areas as the lungs, intestines, or vagina -- in study participants with malaria. The researchers say that their unexpected finding provides new insight into how the human body responds to malaria infection and may ultimately help to identify new ways to treat malaria or develop vaccines. Read more. Access original article.

Italy sees the spread of *Aedes koreicus,* a species of mosquito unafraid of the cold

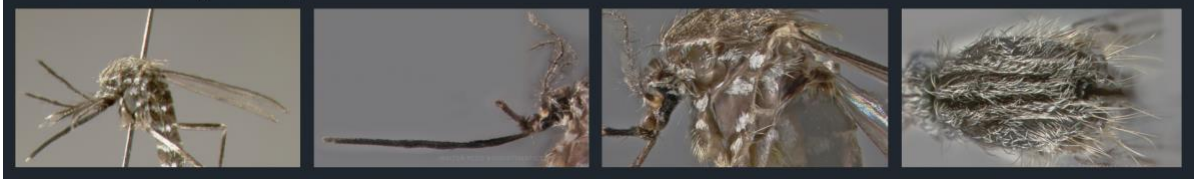


The anthropophilic and cold-tolerant mosquito species *Aedes koreicus* was first detected in the northeast of Italy in 2011, but is now reported to be spreading to the southwest of the county. Native to East Asia and a potential vector of *Dirofilalria immitis*, *Brugia malayi*, Chikungunya, and Japanese encephalitis, this species has raised concerns about its potential to spread through Europe and about its possible role as a vector of diseases in the Alpine area. Read more. Original article.

KNOW YOUR MOSQUITO

Aedes koreicus

- This invasive mosquito was originally described from Korea, and it is native to northeast China, Russia, the Korean peninsula, and Japan.
- It has been recently found in parts of Europe, increasing its distribution very fast.
- In the Oriental Region, immature *Ae. koreicus* are typically found in natural containers such as, small rock pools, tree holes, plant axils, containing still fresh water with decaying tree leaves.
- In Europe, larvae are primarily associated with artificial containers such as abandoned tyres and unused construction equipment, and in some natural containers.
- *Ae. koreicus* is found in urban areas, in close proximity to humans, heightening concern for its role in arthropod-borne disease transmission.
- In colder regions, the species overwinters as eggs.
- Adults feed on humans, domestic animals, and farm animals during day and night hours.
- It is a potential vector of Japanese Encephalitis virus, dog heartworm (*Dirofilalria immitis)* and lymphatic filariasis (*Brugia malayi).*



A BITE OF HUMOUR

KNOW YOUR MOSQUITO TRAP

Tyre Trap

What mosquitoes does it attract?

- Attractive to gravid (egg bearing) container breeding females mosquitoes. The trap collects larvae.

How does it work?

- Gravid females are attracted to the aged water, the black colour and the shape of a tyre trap.
- Depending on the species, mosquitoes lay their eggs either individually, just above the water line on the tyre walls e.g., *Aedes* spp., or forming a raft on the water surface e.g., *Culex* spp.

How to process a Tyre Trap?

- Make aged water at the office by adding 2 Lucerne rabbit pellets to a 10 litre water container and let it sit for a week before using it.
- To check for larvae, empty the tyre into a white tray.
- Replace the water every time you check the trap and add 2 S-methoprene pellets (1 long pellet per litre of water).
- Clean the tyre with a brush if the trap was positive or the water is smelly or dirty.
- Rinse the tyre trap with aged water before refiling.

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