New Zealand BioSecure

BORDER HEALTH NEWSLETTER

FEBRUARY 2023

NAU MAI, HAERE MAI - WELCOME!

Kia ora koutou katoa,

Our thoughts are with all of those that have been affected by the cyclone and floods. We are sending major good vibes your way.

This month, learn more about CO_2-Baited Light Traps, why you should love them, and why setting them up at your PoE is paramount. Also, talking about Light Traps, we want to congratulate Taranaki HPOs for developing a solar-powered CO_2-Baited Light Trap; scroll down and look at their impeccable set-up! We also congratulate Emma Thirkettle and Brett Thompson for capturing the best mosquito photos of the month. Taking mosquito group photos can be challenging, and they have mastered the skill. Finally, have some fun by visiting our bite-of-humour section.

In the news this month, learn about the *Anopheles* mosquitoes spreading south and to higher elevations in Africa thanks to changes in weather patterns. Read about the discovery of *Aedes aegypti*'s unique chromosomes features. Also, learn about the development of a new vaccine against Japanese Encephalitis in pigs to help stop the spread of the disease in Australia. Finally, read about the development of new technologies to studying the feeding behaviour of mosquitoes utilising patches of synthetic skin made with a 3D printer, cameras and machine-learning software.

Happy reading!

SURVEILLANCE

During February 1,607 routine and enhanced surveillance samples were collected by staff from 12 PHUs (Figure 1). The samples included 311 positive larval samples and 130 positive adult samples, leading to a total of 3,301 adults and 18,111 larvae identified over the past month (Table 1). *Culex quinquefasciatus* are the dominant larval species this month, which is the same as this month last year (Table 1).

In total, seven mosquito species have been collected this month (Table 1), three less than collected last month.

Compared to this same month last year, the total number of larvae and adults have shown a decrease (39% and 21% respectively) (Table 1).

Compared to the previous month, both mosquito larval and adult numbers have shown an increase (30% and 85% respectively).

Table 1. Adult and larvae sampled by the New Zealand surveillance program during February 2022 & 2023

Species (common name)	Adults		Larvae	
	Feb 23	Feb 22	Feb 23	Feb 22
Aedes antipodeus (winter mosquito)	14	1	-	-
Ae australis (saltwater mosquito)	1	-	-	-
Ae notoscriptus (striped mosquito)	135	692	4,299	1,779
Ae subalbirostris (no common name)	-	-	-	2
Coquillettidia iracunda (no common name)	-	24	-	-
Culex pervigilans (vigilant mosquito)	330	689	1,242	2,148
Cx quinquefasciatus (southern house mosquito)	2,770	2,593	12,512	25,613
Cx asteliae (no common name)	-	-	6	-
Culex sp.	50	201	-	2
Opifex fuscus (rock pool mosquito)	1	-	52	117
Total	**3,301**	**4,200**	**18,111**	**29,661**

The highest number of larvae sampled this month was obtained in Canterbury (7,104 larvae) followed by Northland (3,371 larvae) (Figure 1).

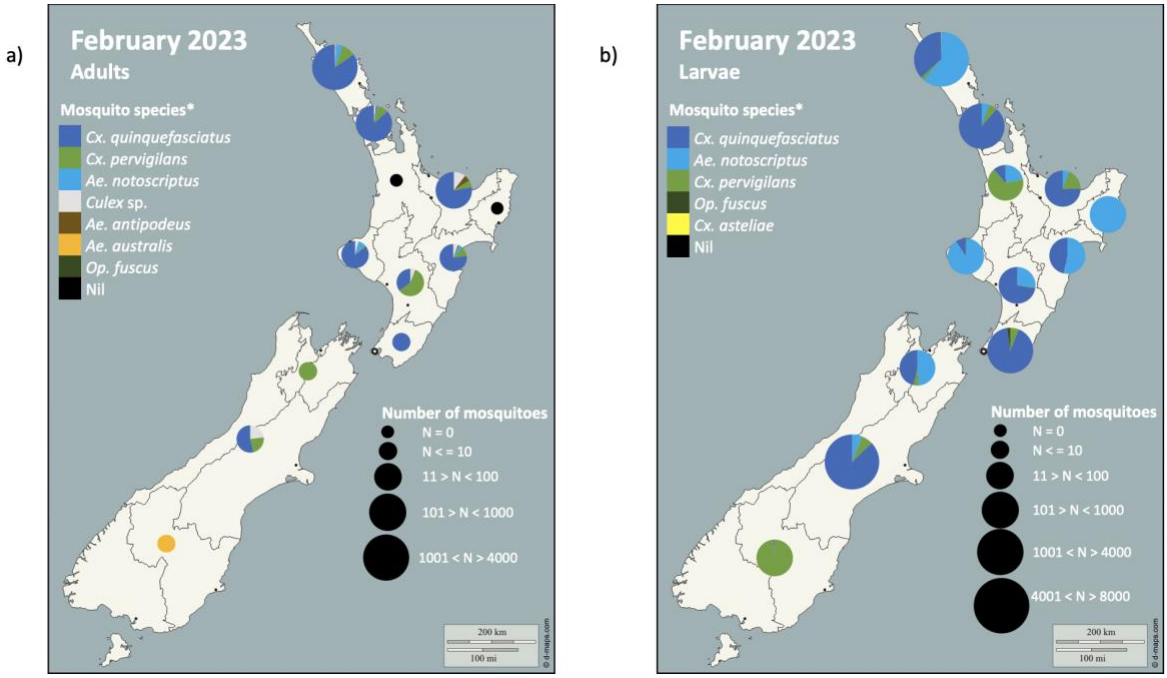


Figure 1. Total mosquito adults (a) and larvae (b) sampled in New Zealand during the February 2023 surveillance period. Please note that the markers represent the PHUs and not the specific sites where the samples have been taken.
* The mosquito species are listed in order from the most abundant to the least abundant.

Aedes notoscriptus larval numbers have shown an increase in nine PHUs and a decrease in two PHUs 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 an increase in nine PHUs and a decrease in two from this same month last year.

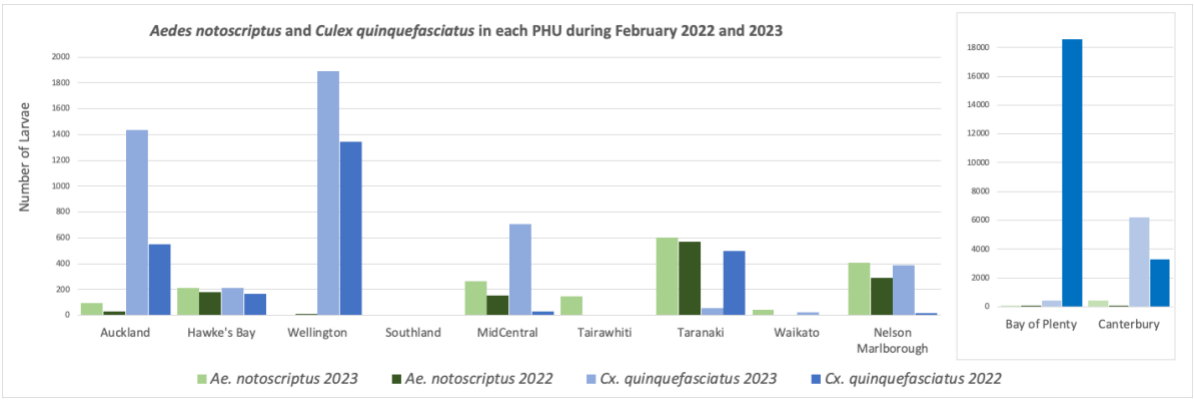


Figure 2. Comparison between introduced mosquito species sampled in each PHU during February 2022 and 2023. *Please note the different scale for the number of larvae present in Bay of Plenty and Canterbury in comparison to the other PHUs.

In contrast with previous findings, *Culex quinquefasciatus* has been detected this month in Public Health South, two 1st instar larvae were collected from a routine surveillance tyre trap at Queenstown Airport (Figure 2).

INCURSIONS AND INTERCEPTIONS

During February, HPOs responded to three suspected interception (Table 2).

Table 2. Suspected interception during February 2023

Date	Species	Location	Circumstances
14.02.2023	1 Female *Culex quinquefasciatus*	Christchurch International Airport	Found alive in the MPI office adjacent to the International Arrivals Hall.
27.02.2023	1 Female *Aedes antipodeus*	Auckland International Airport	Found alive and captured by MPI officer in the ITB Auckland Inspection Bench
28.02.2023	1 Female *Culex quinquefasciatus*	Wellington International Airport	Found alive and caught by an MPI officer in the MPI inspection area, near a routine surveillance trap.

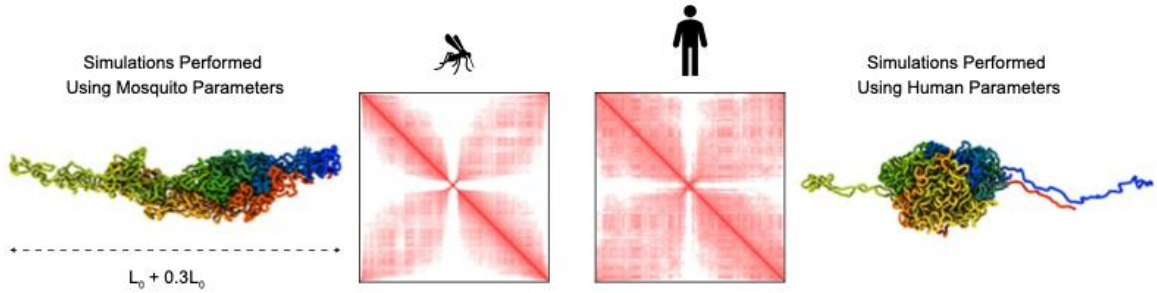
NEWS ARTICLES FROM AROUND THE WORLD

Climate change portends wider malaria risk as mosquitoes spread south and to higher elevations in Africa

A new study from Georgetown University finds warming temperatures are allowing malaria-carrying mosquitoes to invade new regions and reach higher altitudes—underscoring the

effect of climate change on spreading disease. Using data from the last 120 years, researchers found that *Anopheles* mosquito populations in sub-Saharan Africa gained an average of 6.5 metres of elevation per year. They also found the species had expanded its habitats south of the equator by nearly 4.7 kilometres per year. The pace tracks with the historical effects of climate change and could help explain how malaria's reach has expanded in recent years. The investigators focused on mosquitoes in the genus *Anopheles* both because of their ability to spread malaria, and because of a unique historical dataset tracking their movements. Continue reading. Access full article.

3D architecture of *Aedes aegypti*'s chromosomes may offer clues on gene expression, regulation



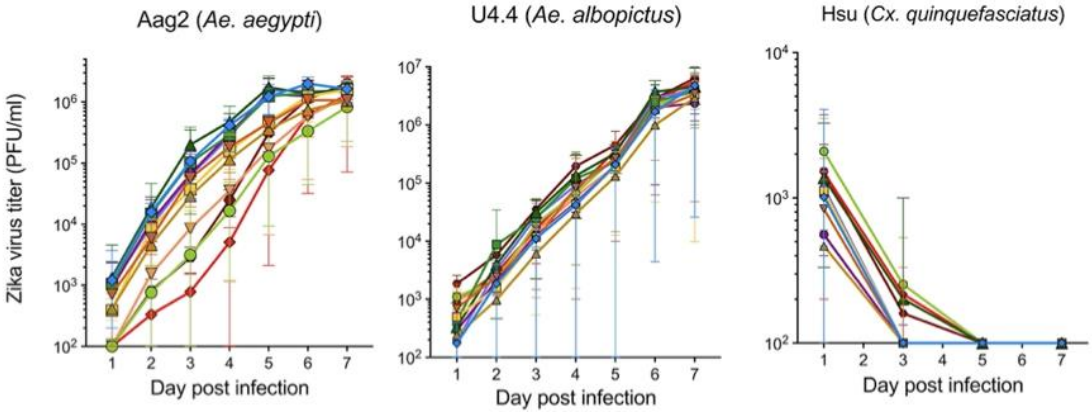
When it comes to DNA, one pesky mosquito turns out to be a rebel among species. Researchers at Rice University's Centre for Theoretical Biological Physics (CTBP) are looking for clues on how the folded 3D shapes of chromosomes might determine gene expression and regulation. Most living things have threadlike chromosomes that fold to fit inside the nuclei of cells in one of two ways. But Aedes aegypti defy this dichotomy with chromosomes organized as fluid-yet-oriented "liquid crystals." Study co-author Peter Wolynes said; "Even though so many different species have been mapped, they still largely fall into one of these two different classes." "The *Aedes aegypti* mosquito is the first real outlier." Read more. See full article.

Novel vaccine to stop the spread of Japanese encephalitis virus in pigs

Scientists at The University of Queensland have developed a novel vaccine for Japanese encephalitis virus (JEV) in pigs, to help stop the spread of the disease in Australia. When pigs

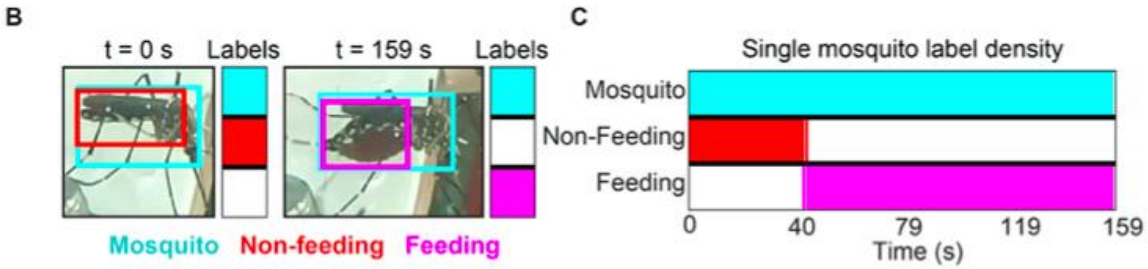
are bitten by virus-carrying mosquitoes the virus is amplified, increasing the risk to people who may be bitten by a mosquito, said Dr Jody Hobson-Peters of UQ's School of Chemistry and Molecular Biosciences. UQ-developed chimera virus technology was used to make a 'hybrid' version of the virus, using a harmless-to-humans, mosquito-only Australian virus – the Binjari virus. "The resulting chimeric – or hybrid – virus looks identical to JEV but can only grow in mosquito cells and also happens to be dead in this vaccine, so is very safe to use," Dr Hobson-Peters said. Read more here. Access full article.

New Zika virus lineages show increased fitness



Zika virus infections have become a local epidemic in the Americas at various time points in the recent past. A recent study attempted to explore whether this was due to increased transmissibility characteristics due to mutation or recombination. The study, published in the journal PLOS Neglected Tropical Diseases, aimed to explore the possible phenotypic adaptation of the Zika virus to increase its transmissibility and virulence in the Americas. Utilising an array of Zika virus samples taken during the 2015-16 pandemic, the scientists analysed their genomic sequences. They then identified lineages that could have emerged during this time, looking for differences in fitness. The study provides a screening framework for differences in fitness over an epidemic. Read more. Access article.

Using patches of synthetic skin to test blood-sucking behaviour of mosquitoes



Rice University bioengineers have teamed up with tropical medicine experts from Tulane University to take some of the pain out of studying the feeding behaviour of mosquitoes. “Many mosquito experiments still rely on human volunteers and animal subjects," said Kevin Janson, a Rice bioengineering graduate student and lead co-author of a study about the research, published this week in Frontiers in Bioengineering and Biotechnology. He and his co-authors found a way to automate the collection and processing of that data using

inexpensive cameras and machine-learning software. To eliminate the need for live volunteers, their system uses patches of synthetic skin made with a 3D printer. Read more. Find video here. Access original article.

KNOW YOUR MOSQUITO TRAP

Click here to find the 'how to care for your light trap' feature

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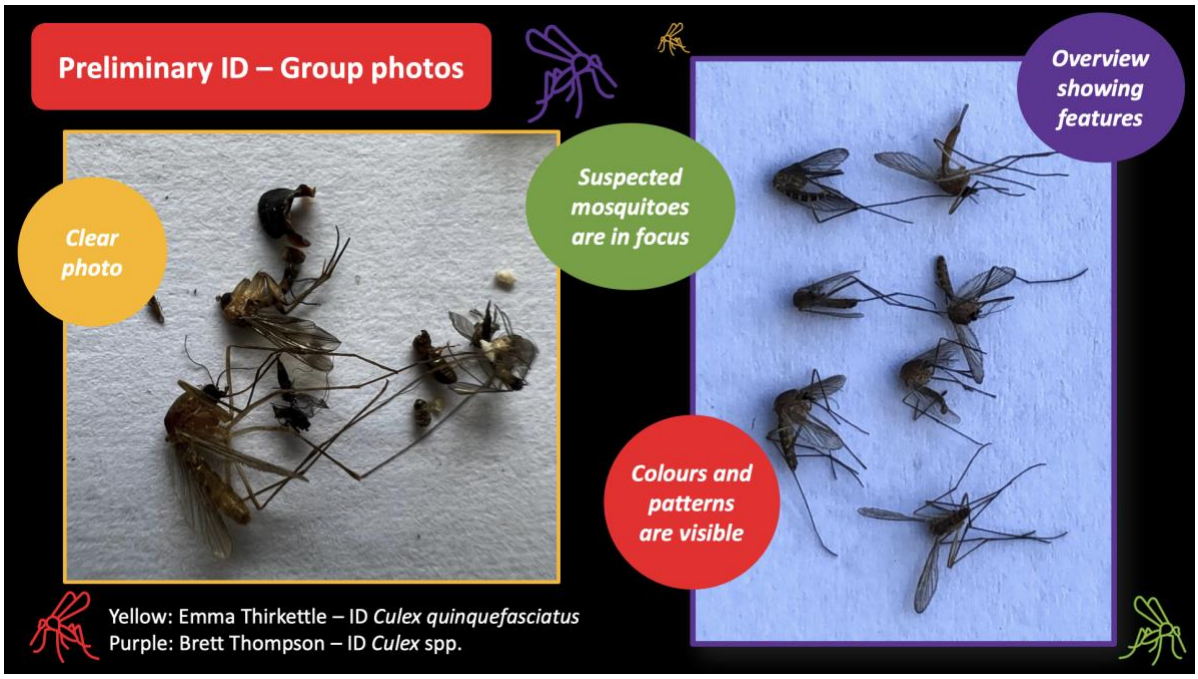
BEST MOZZIE PHOTOS OF THE MONTH



A BITE OF HUMOUR

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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