NEW ZEALAND BIOSECURE

BORDER HEALTH NEWSLETTER – JANUARY 2022

WELCOME!

Kia ora koutou,

It's been a warm start to the new year and a busy mosquito season! In the last newsletter, we looked at artificial containers as breeding habitats for mosquitoes and learned what items may be breeding mosquitoes in our backyards. This month, our *Know Your Breeding Habitat* segment is focusing on the naturally occurring containers that become habitats for mosquitoes. In mosquito news, hear the *buzz* about two different ways that researchers are using acoustic data to learn more about mosquitoes and new methods of mosquito control. *Sounds* interesting!

Please note, one of our team members is currently away on extended leave and the laboratory is working with a reduced number of staff on site as part of our COVID-19 safety protocols. Increased seasonal sample volumes along with courier disruptions and staff reductions mean that there may be an increased turnaround time for processing results. The lab will be prioritising high risk locations, adult surveillance samples, and interceptions. An On-Call Entomologist will continue to be available as usual. We appreciate your continued support and patience during this busy time of year.

Happy reading!

SURVEILLANCE

During the month of January, 1,136 routine samples were collected by staff from 10 DHBs (Figure 1). The samples included 244 positive larval samples and 142 positive adult samples, leading to a total of 2,134 adults and 22,207 larvae identified over the past month (Table 1). The dominant larval species this month is *Culex quinquefasciatus*, the same as last year (Table 1).

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

Compared to this same month last year, both the total number of larvae and total number of adults have shown a decrease (-13% and -67% respectively) (Table 1).

Compared to the previous month, mosquito larval numbers have shown an increase (49%) while adult numbers have shown a decrease (-13%).

Table 1. Adult and larvae sampled by the New Zealand surveillance program during January 2021 & 2022

Species (common name)	Adults		Larvae	
	Jan 22	Jan 21	Jan 22	Jan 21
Ae antipodeus (winter mosquito)	11	4	-	-
Ae notoscriptus (striped mosquito)	326	422	3,733	4,100
Coq iracunda (no common name)	5	20	-	-
Cx asteliae (no common name)	1	-	-	-
Cx pervigilans (vigilant mosquito)	431	576	3,704	3,691
Cx quinquefasciatus (southern house mosquito)	1,300	5,447	14,544	17,706
Culex sp. (likely *quinquefasciatus* or *pervigilans*, missing key ID features)	60	46	1	-
Opifex fuscus (rock pool mosquito)	-	-	225	147
Total	**2,134**	**6,515**	**22,207**	**25,644**

The highest number of larvae sampled this month was obtained in Toi Te Ora Public Health (10,034 larvae) followed by Northland DHB (4,508 larvae) (Figure 1).

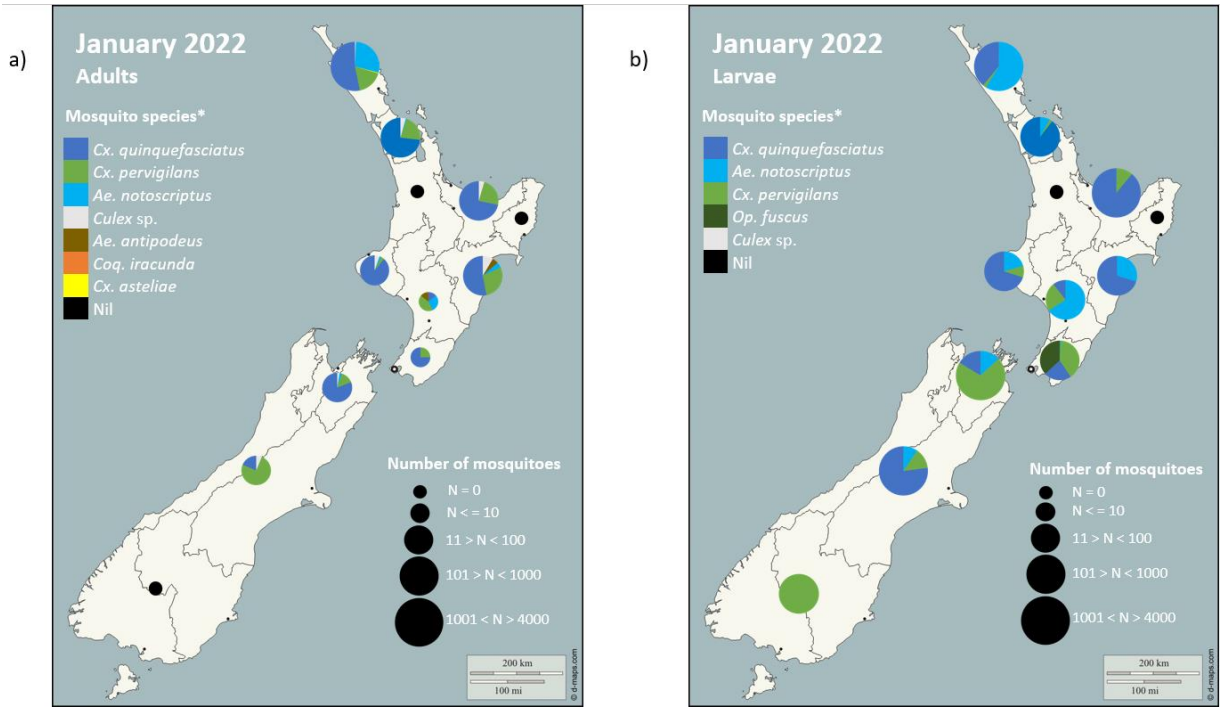


Figure 1. Total mosquito adults (a) and larvae (b) sampled in New Zealand during the January 2022 surveillance period. Please note that the markers represent the DHBs and not the specific sites where the samples have been taken.
* The mosquito species are listed in order from the most abundant to the least abundant.

Aedes notoscriptus larval numbers have shown an increase in five DHBs and a decrease in four DHBs from this same month last year (Figure 2). No sampling occurred in Tairawhiti DHB or Waikato DHB this month and *Aedes notoscriptus* is therefore shown as absent. 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 six DHBs and a decrease in three from this same month last year. *Culex quinquefasciatus* has not been recorded this month, this year, or last year in Public Health South (Figure 2).

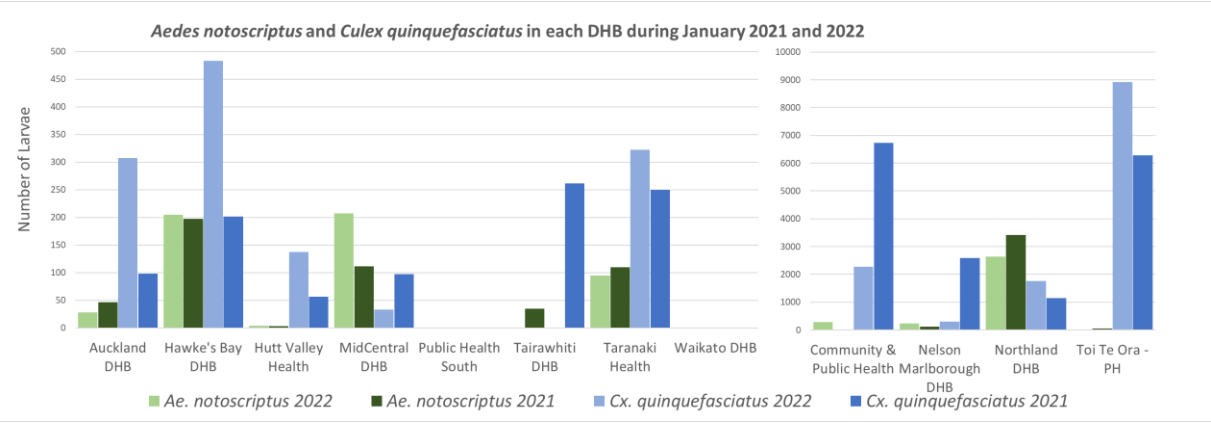


Figure 2. Comparison between introduced mosquito species sampled in each DHB during January 2021 and 2022. *Please note the different scale for the number of larvae present in Community & Public Health, Nelson Marlborough DHB, Northland DHB, and Toi Te Ora PH in comparison to the other DHBs.

INCURSIONS AND INTERCEPTIONS

During January, HPOs responded to four suspected interceptions all involving locally occurring species suspected to be of local origin (Table 2).

Table 2. Suspected interceptions during January 2022.

Date	Species	Location	Circumstances
05.01.2022	1 male *Culex* (*Culex*) *quinquefasciatus*	The Warehouse Distribution Centre, Rolleston	Found alive in a container of clothing that had departed Fuzhou China. Likely of local origin as the container had been in transit for a long time and had been in NZ for several days.
21.01.2022	1 female *Culex* (*Culex*) *pervigilans*	The Warehouse Distribution Centre, Rolleston	Found alive in a container of bags/backpacks originating from Shanghai, China. Container was devanned at The Warehouse facility in Rolleston.
25.01.2022	1 female *Culex* (*Culex*) *quinquefasciatus*	Fresh Direct Auckland, Mount Wellington	Found alive during MPI inspection inside grape bag of fresh grapes from Australia. Cargo had been irradiated before exporting.
27.01.2022	1 male *Culex* (*Culex*) *quinquefasciatus*	PrimePort, Timaru	The mosquito was found flying around the container terminal hut building on the evening of Thursday 27th January.

NEWS ARTICLES FROM AROUND THE WORLD

Climate change could see mosquitoes from the tropics thriving in NZ

As the temperatures rise due to climate change, exotic tropical mosquito species are more likely to survive in New Zealand. An ongoing survey of the country's mosquitoes has begun to reveal some interesting trends – including more natives than expected – but experts need more South Islanders, farmers, and trampers to send them their mozzies. Read more.

Tracking mosquito species with large-scale acoustic data

The HumBug Project based at University of Oxford is working to develop novel survey methods to identify different species of mosquitoes using the acoustic signature of their flight tones. Using sound recordings of wild mosquitoes, HumBug is building an extensive database of acoustic data to train machine learning algorithms to classify mosquitoes based on species, while also accounting for other variables that can affect the flight tone such as the sex of a mosquito, its overall size, and even the ambient temperature. Read more.

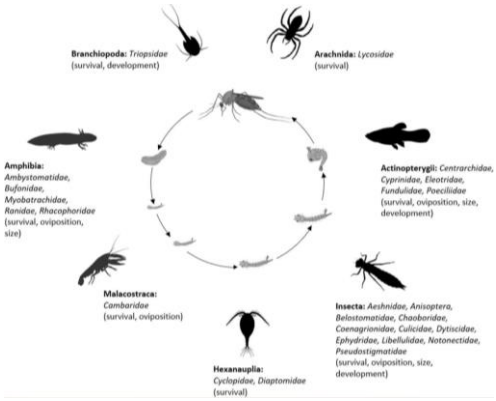
"We studied the sounds of mosquitoes' mating rituals – our findings could help fight malaria"

Mosquitoes' mating ritual involves a male identifying and pursuing a flying female by detecting her faint flight tone. A recent study in Science Advances found that male mosquitoes, but not females, altered their flight tones in a daily pattern. By adjusting their wing beat during swarming, they're better able to hear females and increase their chances of finding one to mate with. These findings may be important for mosquito control efforts which release sterile mutant males into a population to mate with wild females and produce non-viable eggs. Results suggest that to create a successful programme, it may be important to assess male and female flight tone distributions, alongside male hearing ranges, before releasing the mutant mosquitoes to ensure the sterile males are strong suitors and are able to efficiently find the resident females. Read more. Access the original article.

Dengue virus infection modifies mosquito blood-feeding behaviour to increase transmission to the host

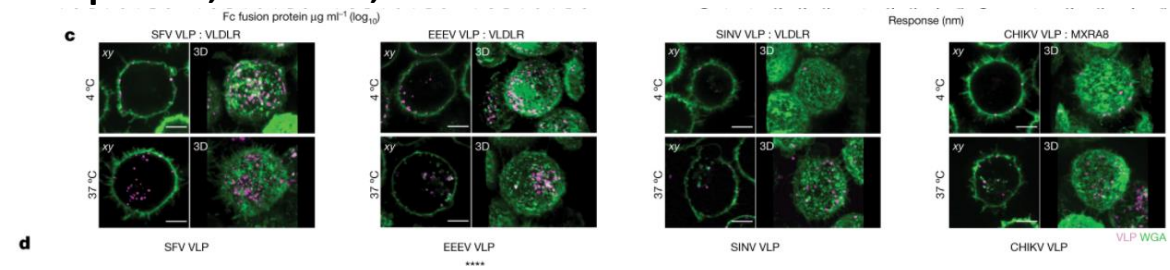
Dengue viruses are spread by mosquitoes during biting, and research recently published in PNAS demonstrates that dengue viruses modify blood-feeding behaviour of infected mosquitoes, leading to increased attraction to hosts and increased biting frequency. The dengue infected mosquitoes displayed decreased biting efficiency, needed to bite more to get the same amount of blood as an uninfected mosquito, thereby increasing their vector capacity and furthering successive transmission. Access the original article.

Disease predictions can be improved by factoring in mosquito predators



The way mosquitoes react to predators should be included in disease models, say researchers behind a new study. Research led by Imperial College London and Pennsylvania State University scientists suggests the information can improve predictions of when and where there might be high numbers of human infections with mosquito-borne diseases. The study shows how the presence of different predators can cause significant changes for mosquitoes' bodies and behaviours, which alter the likelihood of them passing on diseases to humans, including malaria, West Nile virus and dengue. Read more. Access the original article.

Study identifies cellular receptors for alphaviruses shared across mosquitoes, humans, and animals



Alphaviruses, like many other arthropod-borne viruses, infect vertebrate species and insect vectors separated by hundreds of millions of years of evolutionary history. Entry into evolutionarily divergent host cells can be accomplished by recognition of different cellular receptors in different species, or by binding to receptors that are highly conserved across species. A new study led by researchers at Harvard Medical School has identified a set of cellular receptors for at least three related alphaviruses shared across mosquitoes, humans, and animals that host the virus. Going a step further, the researchers tested a "decoy" molecule that successfully prevented infection and slowed disease progression in a series of experiments in cells and animal models, an important first step toward developing preventive and curative medicines against these highly pathogenic viruses with pandemic potential. Read more. Access the original article.

KNOW YOUR BREEDING HABITAT

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