NEW ZEALAND BIOSECURE

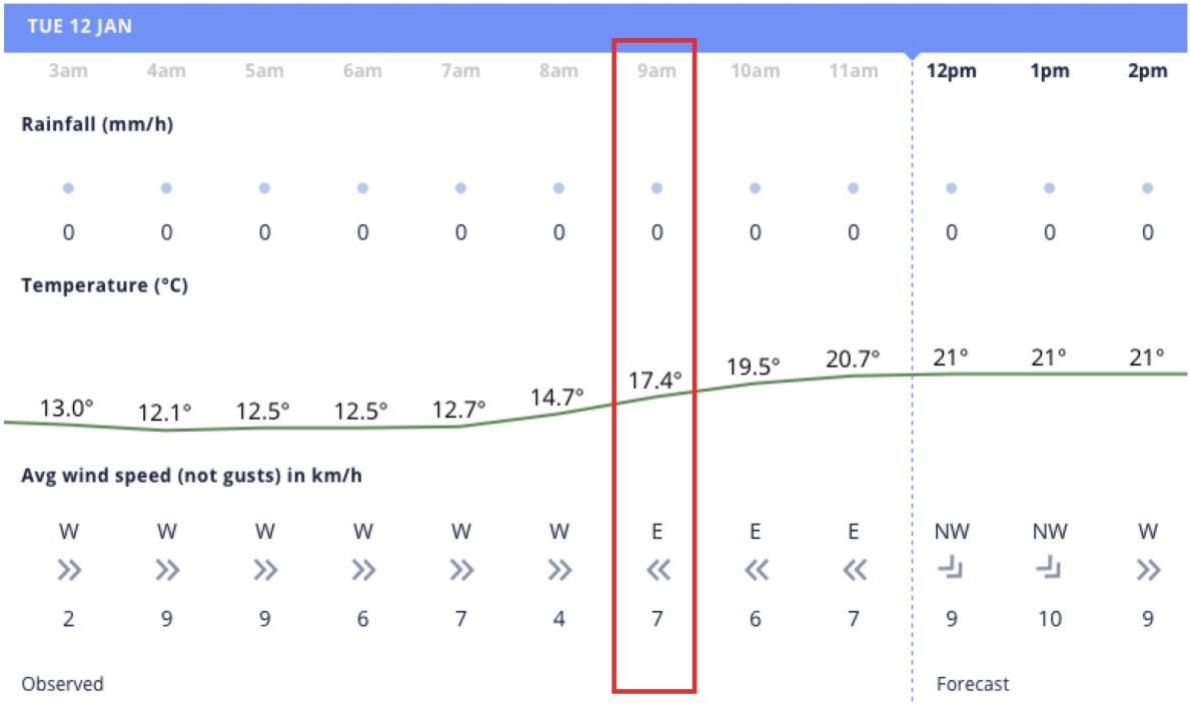
BORDER HEALTH NEWSLETTER – DECEMBER 2020

WELCOME!

Kia Ora Koutou,

Happy New Year everybody! We hope you had an enjoyable and relaxing time during the holiday's break.

You may have noticed that when creating a new sample in the database, there is a new tab labelled Weather Conditions. This tab has been added as a reminder that this information is to be recorded every time you do any mosquito sampling activity. Climatic conditions are key predictors for insect abundance and location suitability for the establishment of introduced species or the spread of already present species. This is why recording climatic conditions is very important. Furthermore, weather condition records are a requirement of the EPA permission to Use S-Methoprene permit annual report, please remember to collect the information while in the field or check the MetService web page every time you collect a mosquito sample. To do this access the MetService web page, select your city and check for the information at the time of sampling, then record the temperature and wind speed and direction.



For example, at 9 am the temperature was 17.4 degrees and the wind blew from the East at 7km/h.

If you have any questions regarding the record of the weather conditions please contact the NZB lab.

This month we congratulate Braeden Hancock for getting the Best mozzie picture of the month! Scroll down to admire a series of great mozzie pictures!

Have you been finding it easy or hard to assign your sample to a particular Reason for Sampling in the Online database? Check out the Mix and Match sampling quiz we have prepared for you and test your knowledge on this subject.

In the news this month read about how although being a poor vector of the Zika virus, Aedes albopictus can still trigger a Zika outbreak. Also, learn how Plasmodium falciparum speeds up its development when Anopheles gambiae ingest more than one blood meal and the implications of this process on malaria control plans. Furthermore, read about how Artificial Intelligence is being trained to identify morphologically cryptic mosquito species. And finally, learn how Anopheles cruzii, a vector of malaria, is pushed into the cities due to the anthropogenic use on the Brazilian native forest.

SURVEILLANCE

During December 1325 samples were collected by staff from 11 DHBs (Figure 1). The samples included 142 positive larval samples and 59 positive adult samples, leading to a total of 1110 adults and 6155 larvae identified over the past month (Table 1). The dominant larval species this month is *Culex quinquefasciatus,* while last year was *Aedes notoscriptus*.

Compared to this same month last year, the total number of larvae has shown a decrease (23%) while the total number of adults has shown an increase (67%) (Table 1).

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

Table 1. Adult and larvae sampled by the New Zealand surveillance program during December 2019 & 2020

Species (common name)	Adults		Larvae	
	Dec 20	Dec 19	Dec 20	Dec 19
Aedes notoscriptus (striped mosquito)	598	147	2400	3142
Ae antipodeus (winter mosquito)	10	17	-	-
Ae subalbirostris (no common name)	-	-	-	2
Coquillettidia iracunda (no common name)	3	11	-	-
Culex pervigilans (vigilant mosquito)	93	52	956	2264
Cx quinquefasciatus (southern house mosquito)	378	137	2768	2072
Culex sp.	28	1	-	-
Opifex fuscus (rock pool mosquito)	-	-	31	79
Total	**1110**	**365**	**6155**	**7559**

Compared to last month, mosquito larval and adult numbers have shown an increase (3% and 5450% respectively (Table 1).

The highest number of larvae sampled this month was obtained in Northland DHB (3045 larvae) followed by Toi Te Ora - PH (918 larvae) (Figure 1).

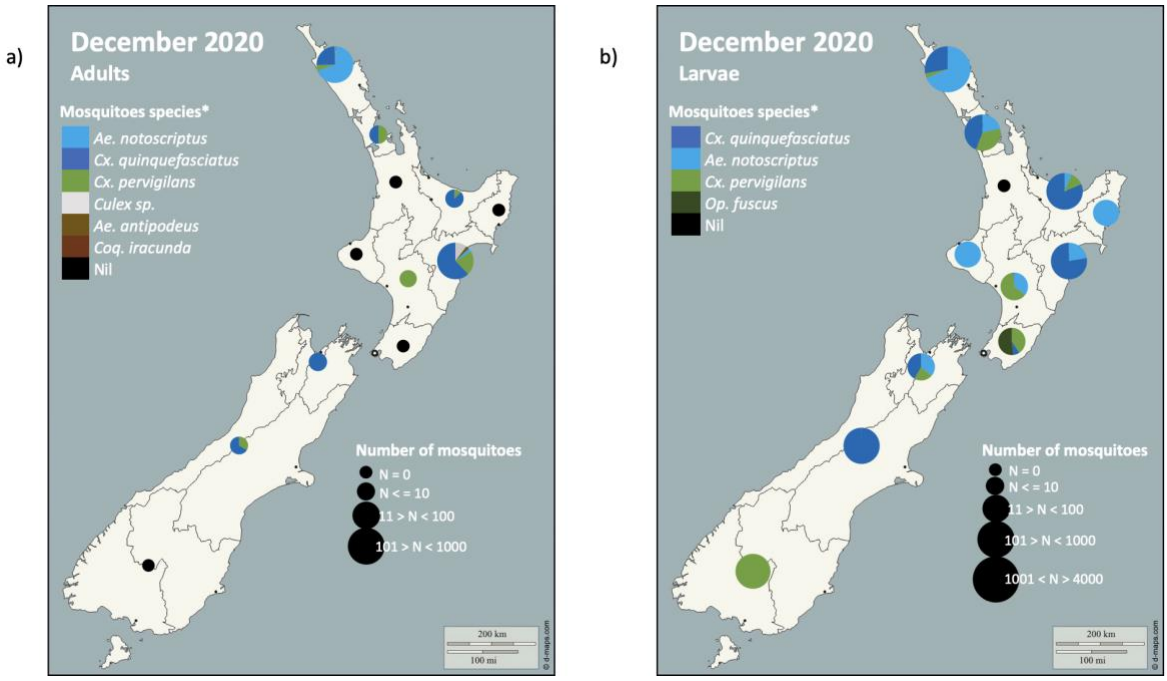


Figure 1. Total mosquito adults (a) and larvae (b) sampled in New Zealand during the December 2020 surveillance period.
* The mosquito species are listed in order from the most abundant to the least abundant.
Please note that the markers represent the DHBs and not the specific sites where the samples have been taken.

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

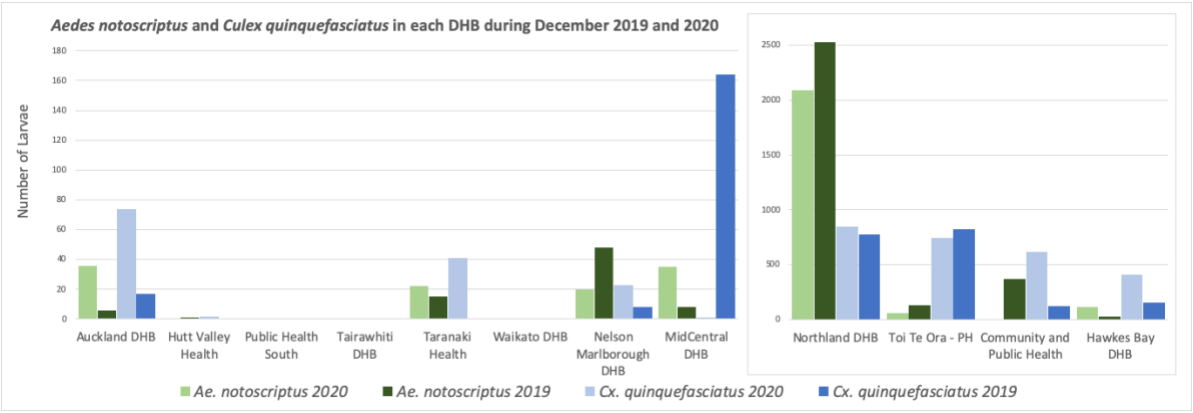


Figure 2. Comparison between introduced mosquitoes sampled in each DHB New Zealand during December 2019 and 2020.
*Please note the different scale for the number of larvae present in Northland DHB, Toi Te Ora – PH, Community and Public Health and Hawkes Bay DHB in comparison to the other DHBs.
Disclaimer: Note that all comparisons made have not been statistically tested and can be due to sampling effort.

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

INCURSIONS AND INTERCEPTIONS

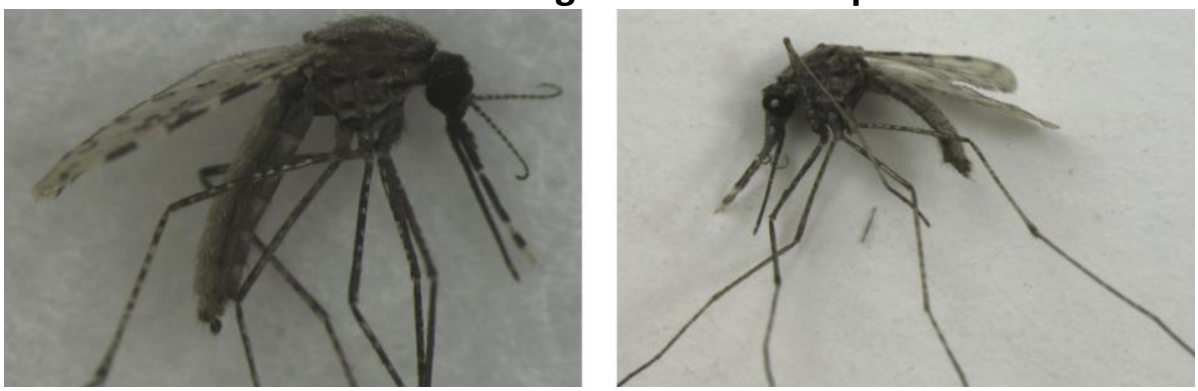
During December HPOs have responded to nine suspected interceptions, including four events where exotic mosquitoes have been detected. Exotic mosquitoes are highlighted in blue (Table 2). Community and Public Health DHB has been particularly busy this month responding to a series of suspected interceptions at Sorted Logistics a Transitional Facility in Christchurch.

Table 2. Suspected interceptions during December 2020.

Date	Species	Location	Circumstances
01.12.2020	1 Non biting midge	Trendy Mirrors, Sydenham, Christchurch	Found dead attached to a cardboard box in a container of mirrors from China.
03.12.2020	1 Female *Culex* (*Culex*) sp.	Sorted Logistics, Hornby, Christchurch	Found dead in a container of Kmart goods from China. The specimen was put in a sticky substance and was very damaged. ID to a species level was not possible. Remaining features indicated exotic origin.
03.12.2020	1 Fungus gnat 1 Lace wing	Sorted Logistics, Hornby, Christchurch	Found alive in a container of Kmart goods from China.
04.12.2020	1 Male *Culex tritaeniorhynchus*	Sorted Logistics, Hornby, Christchurch	Found dead in a container of Kmart goods from Singapore.
07.12.2020	30+ Non mosquitoes Gall midges Fungus gnats	Emerson Transport, Hastings	Found alive and dead (wrapped in plastic) in pallets of Sulphamic Acid in a container from Malaysia.
08.12.2020	1 Female *Anopheles subpictus* 3 Female *Culex vishnui*	Tauranga Port on board Silver Oak Logging ship	Found dead during ship sanitation of the Silver Oak logging ship at Tauranga Port. Origin of mosquitoes likely India.
16.12.2020	1 Female *Culex* (*Pipiens*) - subspecies to be confirmed -	Sorted Logistics, Hornby, Christchurch	Found dead by MPI in a container of Kmart goods from China.
21.12.2020	1 Female *Culex quinquefasciatus*	Sorted Logistics, Hornby, Christchurch	Found alive by MPI in a container of bamboo and cane furniture from China.
22.12.2020	1 Non biting midge	Sorted Logistics, Hornby, Christchurch	Found dead in a container of wooden furniture from China.

NEWS ARTICLES FROM AROUND THE WORLD

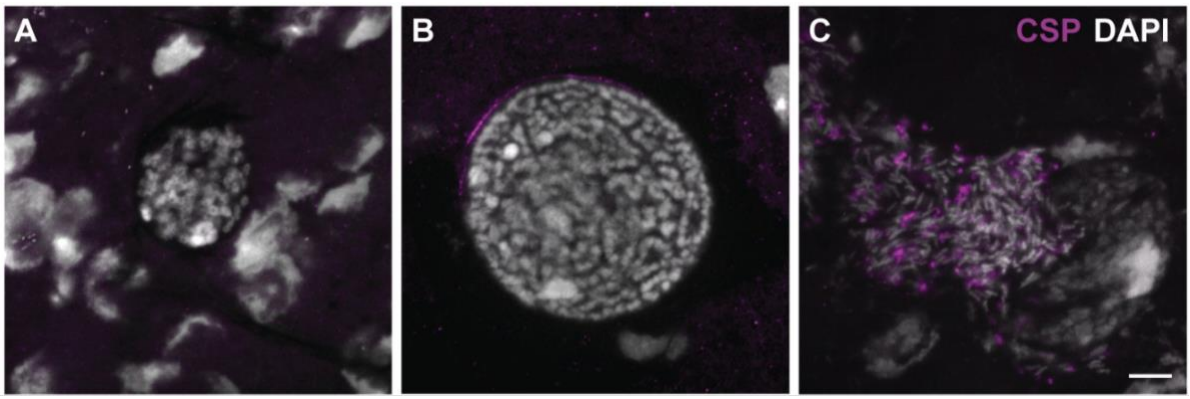
Researchers use artificial intelligence to ID mosquitos



Anopheles stephensi stored by freezing on the left and desiccated at room temperature on the right

Researchers from the Department of Biological Sciences at University of Rhode Island, USA, have used a Convolutional Neural Network (CNNs) and a library of 1709 images of 15 different species of adult mosquitos in a proof of concept study that artificial intelligence can help identify morphologically cryptic species. They predominately used *Anopheles* species, including two subtypes of *Anopheles gambiae*, which are typically identified using molecular tools, and were able to teach the CNN to categorise the images of the different species, as well as distinguishing males and females. The researchers were able to achieve a 96.96% accuracy in species identification. Read more. Access the original article.

Multiple mosquito blood meals accelerate malaria transmission



A second blood meal accelerates oocyst development

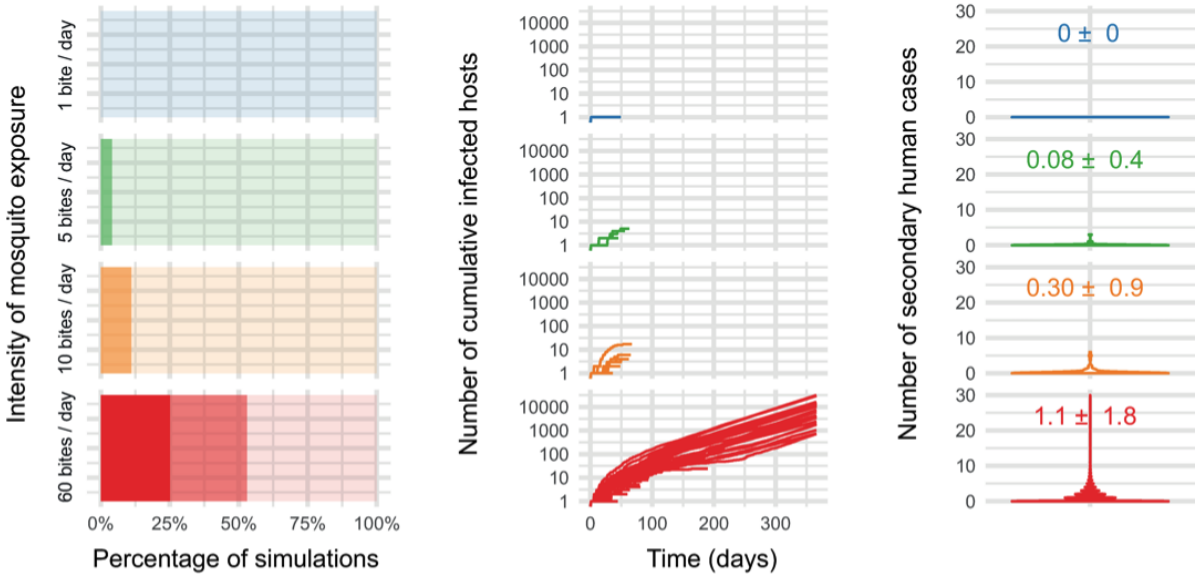
A team of researchers from the USA found that the incubation period for malaria parasites was shortened, and the transmission potential of malaria increased when the infected mosquito consumed further blood meals after being infected with the parasite. The researchers had noticed that most studies looking at malaria infections and transmission generally only used a single blood meal, while in a natural environment an infected mosquito will take multiple blood meals. Read more. Access the original article.

The influence of anthropogenic habitat fragmentation on the genetic structure and diversity of the malaria vector *Anopheles cruzii* (Diptera: Culicidae)

Satellite images of the *Anopheles. cruzii* sampling locations.

Researchers from Brazil, using populations genic analysis looked into the links of genetic diversity, habitat fragmentation and mosquito behaviour. They found that the loss of natural habitat due to human activities, causes the main vector of malaria in the Brazilian Atlantic Forest, *Anopheles cruzii* to seek resources in urban areas. This is causing an increase on interaction between humans and the infected mosquitoes, potentially leading to an increase on malaria cases. The study highlights the importance of evaluating anthropogenic changes on vectors populations and their role as vectors of diseases. Access original article.

Asian tiger mosquito does not pose a major risk for Zika virus epidemics



ZIKV outbreak simulations results

The Asian tiger mosquito, *Aedes albopictus*, is a highly invasive species which is capable of transmitting several arboviruses, including dengue fever and Zika virus. A team of scientists

from the Institut de Recherche Biomédicale des Armées have found that even though the Asian tiger mosquito is able to transmit Zika virus it is not a particularly competent vector for it. This is regardless of if the mosquito is of temperate or tropic origin. However, the scientists did note that in favourable conditions such as high density of mosquitoes, a large scale Zika outbreak may still be triggered by the Asian tiger mosquito. Read more. Access the original article.

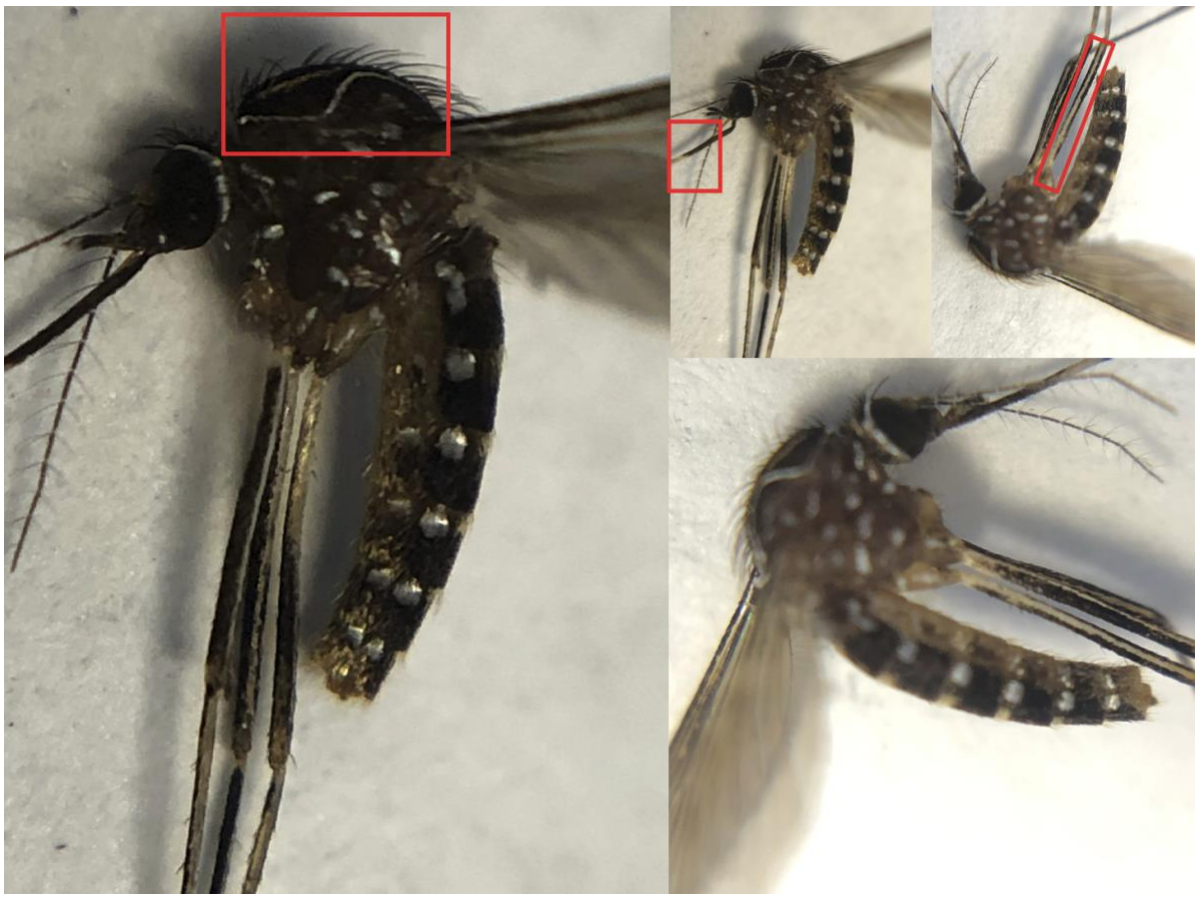
MIX AND MATCH SAMPLING QUIZ

Match the circumstances with the correct Reason for Sampling that should be entered into the Online Database.

Answers will be available in next month newsletter. Good luck!

Circumstances	Reason for Sampling
An adult mosquito was caught by a light trap which is part of a POE routine surveillance. The trap is checked every three days.	Delimiting survey
Three adult mosquitoes were caught by a light trap set up after NZB confirmed the interception of an exotic mosquito in a transitional facility.	Enhanced Surveillance
A mosquito was found alive by MPI in a container from foreign origin. The sample was identified as an exotic mosquito.	Interception
MPI contacted you about a suspected mosquito found in a container from foreign origin. NZB entomologist identified the sample as a fungus gnat.	Suspected Interception
Ten mosquito larvae were obtained from a pond sampled after a member of the public was concerned that exotic mosquitoes were biting them.	Routine Surveillance
Larvae collected at an unkempt pool found near a POE during a 400m survey on neighbouring property.	Public enquiry
Larvae sampled from the inside of a tree hole holding water found during a delimiting survey after an exotic mosquito was intercepted in a transitional facility.	400m survey

THE BEST MOZZIE PICTURE OF THE MONTH



Female *Aedes notoscriptus*

About the photographer: Braeden Hancock is a Health Protection Officer/ Technical Officer working for the Auckland Regional Public Health Service.

About the picture: these pictures were taken while Braeden responded to a public enquiry. A member of the public thought they had captured an Asian Tiger mosquito. These pictures clearly show the main three features for identifying Aedes notoscriptus: a distinctive pattern on the thorax, a white stripe on the femora and a white band on the proboscis.

Characteristics of a good series of Mozzie picture:
- Different pictures are in focus in different mosquito body parts.
- The light allows the viewer to interpret different colours.
- All body parts are distinguishable.

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

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