



NEW ZEALAND BIOSECURE



BORDER HEALTH NEWSLETTER – January 2015

WELCOME!



Fieldtrip in the Wairio wetlands; Photo: Colleen Kem



Noel identifying larvae ; Photo: Colleen Kem

It was great to have some of you in the lab for some training and the excellent discussions, we hope you enjoyed it as much as we did. We will try to run a few more later in the year for those that couldn't make it this month.

Current international discussion is about climate change influencing insect ecology. Strange mosquito activity is being recorded all over the place, more mosquitoes are occurring because of warmer temperatures, and the chances of arbovirus-outbreaks also increases. But the increased movement of mosquitoes around the world probably drives the spread of mosquito-borne disease outbreaks more and faster than a changing climate. With *Aedes notoscriptus* in California, Health authorities received yet another reminder of how easily pest mosquitoes can move about with human activity. They can sneak in and set up home before we even know they're there. Mosquitoes are incredibly adaptable and have left behind their life in tree holes or leaf axils and moved into our cities. They've switched tastes from primates or even birds to people and their pets.

Also the debate about the GM mosquitoes released in Florida is still hot....

WEBSITE

We have added information about [Cockroaches](#) to the Laboratory's Pest section, and the [Entomology Laboratory](#) pages have had a bit of a shuffle to provide more information for the database use, sample forms, label templates and instruction manuals for the new GAT and BG Sentinel traps recently sent out.



SAMPLES

During January 918 samples were collected by staff from 12 DHBs with 326 positive. The numbers doubled up compared to last month and amazingly we had also double the number of larvae compared to January 2014. While we had 100 *Culex quinquefasciatus* larvae last month we now have more than 2000, even in Waikato they are occurring in high numbers. With a total of almost 10.000 mosquitoes this is one of the most productive months.

Species	Adults		Larvae	
	Jan 2015	Jan 2014	Jan 2015	Jan 2014
New Zealand Mozzies				
<i>Aedes antipodeus</i> (winter mosquito)	50	5	Nil	Nil
<i>Ae. australis</i> (saltwater mosquito)	Nil	Nil	24	20
<i>Ae. notoscriptus</i> (striped mosquito)	349	141	2452	1441
<i>Coq. iracunda</i>	184	32	Nil	Nil
<i>Coq. tenuipalpis</i>	4	1	Nil	Nil
<i>Cx pervigilans</i> (vigilant mosquito)	71	12	4778	2125
<i>Cx. quinquefasciatus</i> (southern house mosquito)	379	1018	2105	1189
<i>Opifex fuscus</i> (saltpool mosquito)	Nil	Nil	39	65
Total	1037	1209	9398	4848

INCURSIONS/INTERCEPTIONS

We have had 8 Interceptions in January:

13.01.2015: A male *Culex quinquefasciatus* was found alive in a Van shipped from Japan and parked at the wharf for 3 days (Bledisloe Wharf POA). The specimen was badly damaged in terms of the scales – only few left.

16.01.2015 Mosquitoes were found in nine cars from Japan at POA. The specimens were sent to Tamaki MPI laboratory before they were sent to NZB. They were identified as seven male and one female *Cx. quinquefasciatus*.

20.01.2015: One female *Cx. quinquefasciatus* was found alive at air cargo Auckland.

21.01.2015: In Christchurch one *Cx. quinquefasciatus* was found dead in a container full of household from the Netherlands.

23.01.2015 a: One male *Cx. pervigilans* was found in the Xray baggage area at AIAL

23.01.2015 b One *Cx. quinquefasciatus* was found alive in a container with rice crackers from China, Ceres, 82 Carbine Rd, Mt. Wellington, Auckland.



27.01.2015: In a container with Bananas from Ecuador at Turners and Growers in Auckland, 3 alive and 1 dead mosquitoes were found and have been identified as 3 female and one *Cx. quinquefasciatus*

28.01.2015: One female *Cx. quinquefasciatus* was found in the Xray baggage area at AIAL

NEWS OF THE MONTH

Residents feel the itch of mosquito invasion

Brett Wortman

AN OUTBREAK of mosquitos following rain at Mount Coolum will last for several weeks, the council has warned residents.

Mount Coolum had received 72ml over the past week, Weatherzone meteorologist Ben McBurney said.

A Sunshine Coast Council spokesman confirmed mosquito numbers at Mount Coolum were higher than usual.

"Our adult mosquito surveillance indicates mosquito numbers in this region are currently three times higher than the same period a year ago and with the persistent showers/rain we are expecting them to remain for several weeks," he said.

As mosquitoes can be carriers of diseases such as Ross River fever, people should wear long clothing and insect repellent when outdoors during these "nuisance" periods, he said.

Mount Coolum residents said there was a mosquito outbreak at Mt Coolum National Park, a popular bushwalking destination.

Debbie Higgs, who lives near the entrance to the national park, said the insects were vicious but that had not stopped walkers.

"It's been very busy on the weekends now it's cooler," she said.

Mount Coolum Golf Club groundsman Wayne Fowler's advice is to keep moving.



"The mozzies in the last couple of days have been coming out really bad, especially in the bush areas by the drainage creeks," he said.

He said it was frustrating trying to work. "We put repellent on but even then they still nip through that, and through our shirts."

Mount Coolum Golf Club groundsman, Wayne Fowler, has been tormented by mosquitos the past few days since we've had rain.



PICTURES OF THE MONTH

Who of you got this card from countdown after the weekend shopping and wondered about that picture? A funny mosquito that is, with no proboscis and looking like a big crane fly. Definitely a collector's piece...priceless.



VECTOR-BORNE DISEASES

Recent Local News

Niue mosquito spraying underway

Radio New Zealand-03.02.2015

The Niue government has started a mosquito eradication spraying programme after the recent death of a young woman from chikungunya.

A 22 year old mother reportedly contracted the mohttp://www.thepresstribune.com/event-calendar?source=navsqito-borne illness after spending two weeks in Samoa and died in Niue hospital several days after being admitted.

A Niue opposition MP Terry Coe, is calling for more help from regional agencies to help get rid of the mosquitoes and with advice on medical care to more effectively deal with chikungunya in the Pacific.

He says the government is warning travellers to Samoa, Tonga and the Cook Islands to protect themselves from mosquito bites.

"They've started the mosquito spraying. And they are working from Alofi south and Alofi north and then they're going to go around the rest of the island, hopefully to complete it within a week, so there's two gangs."

Terry Coe says Niue only has one flight a week in and out of the country and seriously ill patients need medical evacuation for treatment off the island but he's not sure the government would support that.



To battle dengue, Tonga hands out mosquito nets

Radio New Zealand

A major clean-up operation involving health authorities, the National Disaster Management Office and the Red Cross is taking place in Tonga to address the dengue outbreak.

There have been 43 confirmed cases since the start of the year with hundreds more suspected.

A collaborative effort is now being made to minimise mosquito breeding areas, by clearing rubbish, old vehicles and places where water may gather.



The Red Cross is also preparing to distribute mosquito nets to the public.

The General Secretary Sione Taumoeofolau says the organisation has built up a large stash of emergency supplies.

"This year we have about 100% coverage of the whole kingdom. We have here mosquito nets if there is any need to be distributed we can do it. If we can do our cleaning faster then the mosquito nets won't need much distribution. We have the stock around Tonga. We have about 4 to 5

thousand mosquito nets ready to be used."

A Tongan Red Cross officer leads a mosquito cleanup operation to combat dengue fever.
Photo: Tonga Red Cross

WPRO: Pacific syndromic surveillance report

Chikungunya outbreaks are on-going in American Samoa, Cook Islands, French Polynesia, New Caledonia, Samoa and Tokelau.

Cook Islands: As of 25 January 2015, there were 13 dengue-like illness cases seen all of which tested dengue RDT negative. Since November 2014 there have been seven *Chikungunya* cases confirmed by the Institut Louis Malarde (ILM), French Polynesia.

French Polynesia: As of 18 January 2015, the estimated number of cases of *Chikungunya* is more than 66,000 since 10 October 2014. The cumulative attack rate is 25%.

Dengue outbreaks are occurring in Fiji, French Polynesia and Tonga

Fiji reports 68 laboratory confirmed cases in the Northern division. The outbreak is localised in the Macuata sub-division; specifically in rural areas. Samples will be sent for serotyping to ILM, French Polynesia.

Dengue serotype-1 outbreak is ongoing in French Polynesia. There were 10 cases confirmed for week ending 18 January 2015. The weekly number of cases in decreasing.



ESR: 2014 Monthly Surveillance Report Monthly Notifiable Disease Surveillance Report - Dec 2014

Chikungunya fever: 18 cases of chikungunya fever (15 confirmed and 3 probable) were notified in December 2014. All cases reported overseas travel during the incubation period to Samoa (16 cases), French Polynesia, and Kiribati (1 case each).

India

CHENNAI: Corporation of Chennai's expenditure on mosquito eradication was 8 crore in 2013-14. This is more than double the amount spent the previous year (3.56 crore), but public complaints about the winged menace also doubled in the period, from 2,457 in 2012-13 to 4,664 in 2013-14.

In response to an RTI application filed by Pradeep Bhatt, coordinator of Bangalore-based the civic body said it spent 3.56 crore in 2012-13 and 5.09 crore in 2013-14 for mosquito fogging in the city. The quantity of diesel used for fogging in the city has also increased over the past few years - from 5.8 lakh litres in 2009 to 16.41 lakh litres in 2012. The number of fogging machines also went up from 236 in 2011 to 347 in 2014.

Though measures like distribution of gambusia fish, mosquito nets and nochi plants to residents continue, the civic body has failed to check breeding of mosquitoes. Residents say there is little to show for the money that the corporation spends annually to fight the vector. "There has been a significant rise in the number of mosquitoes. We are forced to keep all the doors and windows shut all the time," said K Ramadoss of Ayanavaram.

Residents say fogging should be intensified along storm water drains and temple tanks, which are breeding grounds for mosquitoes. "The fun of sitting out in the evening is gone," said P Dharshan, a resident of Teynampet. "I have not seen any fogging my area recently."

Across 200 wards there are more than 12 lakh residential and commercial properties. Water tanks at construction sites, uncovered septic tanks, unused wells and swamps are the main breeding areas of mosquitoes. A sanitary inspector said the corporation sometimes runs out of larvicides. We are also unable to take action against violators because of interference from local politicians. They fear that they will lose votes if we fine people," he said. According to TN Public Health Act, the penalty for not checking mosquito breeding in residential buildings ranges from 50 to 500. Construction sites are fined 500 to 20,000.

Health experts say discarded materials like plastic cups, coconut shells that gather water aid mosquito breeding and hence the spread of diseases like dengue, malaria and chikungunya. Dr S Elango, former director of public health said: "The civic body should grant building plan approval only if the building owner follows vector control measures. Coordination between Southern Railway, PWD, slum clearance board and Metrowater is needed. The corporation has not been fining people for violations."

The corporation says it has intensified spraying of larvicide in drains, lakes and water tanks.



MOSQUITO-DISCUSSIONS

GM mozzies may return to spread bacteria

Cayman News | 04/02/2015 | 10 Comments

(CNS): As the Food and Drug Administration (FDA) in the US considers whether to approve the experimental use of genetically modified mosquitoes in the Florida Keys, the Cayman Islands is planning another trial release of the mutant mozzies this year. But GeneWatch UK, an NGO focused on the genetic industry, has published new evidence that genetically modified insects could spread antibiotic resistant bacteria into the environment, posing a risk to human health.

The GM insects that US officials want to release and which could be coming to Cayman again were developed by the British biotech firm, Oxitec, which conducted experiments here in 2010, in conjunction with the MRCU, releasing the insects in East End.

Mosquito controllers in Florida say that after years of spraying, the *Aedes aegypti* mosquitoes have developed a resistance to most chemical pesticides. Now, the Florida Keys Mosquito Control District wants to try the genetically modified bugs and hope to begin spraying in the spring. The MCD says the surveys it commissioned of area residents suggest that 60 per cent are OK with the trials, and 10 to 20 per cent are opposed. Meanwhile, the plan in Cayman is to go to public consultation before another controlled release takes place on Grand Cayman.

However, GeneWatch says that the GM mosquitoes and agricultural pests used by Oxitec are bred using the common antibiotic tetracycline in their feed and so an open releases of such GM insects could spread antibiotic resistance into the environment, potentially creating more superbugs.

“Mass production of GM insects in factories, using antibiotics as an additive in their feed, could lead to drug resistance in bacteria, leading to the spread of superbugs as billions of insects are released into the environment in future,” warned Dr Helen Wallace, GeneWatch UK’s Director. “This important risk to human health has been ignored by regulators, despite bans on the use of antibiotics in animal feed in many countries.”

Following the release here in 2010, other experimental releases of tens of millions of the mosquitoes have taken place in Brazil and Panama. GeneWatch maintains that if their commercial use is adopted, billions of Oxitec’s GM insects would be released year after year in attempts to suppress wild pest insect populations over vast areas and perhaps whole countries.

“If such GM insects became a new source of antibiotic resistance worldwide, this could have serious adverse impacts on human and animal health,” the organisation stated.

The report raises concerns that the bacteria and antibiotic resistant genes may spread through the insect population, from the mainly male GM insects that are released to their wild mates and offspring, and that horizontal gene transfer may lead to transfer of antibiotic resistance to bacteria, causing food- and water-borne diseases, such as *E. coli*, via larvae that develop in food (agricultural pests) or water (mosquitoes).

GeneWatch also points to the possible transfer to humans or animals, for example by swallowing GM agricultural pests at the larval stage when they will contaminate fruit and vegetable supplies, or swallowing GM mosquito larvae via contaminated water.



Australian mosquitoes discovered in California: What does it mean?

Posted on September 18, 2014 Camoron Webb, Mozziebite (shortened)

Long before planes made the planet a much smaller place, we were already moving mosquitoes massive distances. It could probably be argued that the brown house mosquito, *Culex quinquefasciatus*, first came to Australia in water filled barrels with the first fleet and the movement of the Yellow Fever mosquito, *Aedes aegypti*, and associated pathogens from the Caribbean to Philadelphia and triggered a catastrophic outbreak of disease in 1793.

In more recent times, the spread of the Asian tiger mosquito, *Aedes albopictus*, has been well documented and has raised concerns amongst international health authorities with regard to outbreaks of disease caused by dengue and chikungunya viruses.

This week saw the announcement that a mosquito, *Aedes notoscriptus*, had made its way from (most likely) Australia to California. The mosquito discovery was due to the diligence of two agencies in Los Angeles, The Greater Los Angeles County Vector Control District and San Gabriel Valley Mosquito and Vector Control District.

There was little doubt that without the availability of high quality photographs we wouldn't have been able to offer such a rapid identification. Not so long ago we would have had to ship specimens back and forth to confirm identification.

Apart from questions regarding how this mosquito made it half way around the world, the critical issue now is to assess what pest or public health risk this mosquitoes poses to Los Angeles, California and North America more generally.

Aedes notoscriptus (commonly referred to as the 'backyard mosquito') is widespread in Australia. From the cold climates of Tasmania to the tropical north of the country. The mosquito is also found in New Zealand, Western Pacific and Indonesia.

The mosquito is closely associated with urban areas. Eggs are laid in a wide range of natural and artificial water-holding containers. There are very few Australian's who haven't been bitten by this mosquito. It is a constant companion at summer BBQs and is considered a nuisance-biting pest, mostly biting in the afternoon and early evening. However, it does have broad tastes when it comes to blood feeding. The abundance of this mosquito is relatively low compared to some of our "wetland" mosquitoes (such as *Aedes vigilax* and *Culex annulirostris*) and the mosquito doesn't fly far, generally less than 200m.

The low natural dispersal of the mosquito is thought to have contributed to the emergence of subpopulations in some regions of Australia. There is no doubt assisted movement of mosquitoes is also occurring around the country. As with any container-inhabiting mosquito, human movement will drive the spread of this mosquito in North America.

From a public health perspective, *Aedes notoscriptus* is a less significant nuisance-biting pest than *Aedes albopictus* and *Aedes aegypti*. However, it is a vector of arboviruses and parasites. *Aedes notoscriptus* is an effective vector of Ross River and Barmah Forest viruses. A range arboviruses have also been isolated from field collected specimens in many parts of the country and the mosquito has been implicated in Ross River virus transmission in major cities including Sydney and Brisbane. Neither Ross River virus or Barmah Forest virus are known to exist in California.

Fortunately, the mosquito is generally not considered an effective vector of dengue viruses, West Nile virus, Yellow Fever virus or, chikungunya virus but it has been shown to be



susceptible to Rift Valley fever virus. *Aedes notoscriptus* is an effective vector of dog heartworm, *Dirofilaria immitis*.

How did it get there? We may never know. Mosquitoes can be moved about in lots of different ways, from cargo holds in aircraft and ships to baggage and belongings of individuals. Industrial, mining and agricultural equipment may provide a route of movement too.

Given that established populations have been discovered, it may be more likely that personal belongings may have been moved to California from Australia or New Zealand with travellers or family relocating for work. Perhaps surveys of the local community, combined with genetic analysis of the specimens will help answer this question.

The take home message for local authorities, both in California and Australia, is that the mosquito did make the trip, slipped through the cracks of quarantine and become established. While this introduction may not pose a significant impact to California, the introduction of *Aedes albopictus* to Australia could have far more substantial impacts. If we can export our mosquitoes, we should remain vigilant of the potential for exotic mosquitoes to find their way to us from Asia, Europe or the Americas.

There are strategies in place for the surveillance and control of container-inhabiting mosquitoes in California. These strategies would prove effective in tracking and controlling *Aedes notoscriptus*. The one advantage authorities have is that *Aedes notoscriptus* is readily collected in carbon dioxide baited light traps whereas *Aedes albopictus* and *Aedes aegypti* are generally not collected as often by these traps.

In summary, the mosquito should not be considered a major pest or public health risk. The priority for local authorities should remain the other container-inhabiting species such as *Aedes albopictus* and *Aedes aegypti*. Notwithstanding these species, other mosquitoes associated with urban environments, particularly *Culex spp.*, are currently playing an important role in one of the largest outbreaks of West Nile virus. In fact, the “proportion of mosquitoes infected with West Nile virus is at the highest level ever detected in California

DID YOU KNOW?

Treated mosquito nets may have created an insecticide resistant mosquito But using nets is still a good idea

The Verge, January 5, 2015, by Arielle Duhaime-Ross

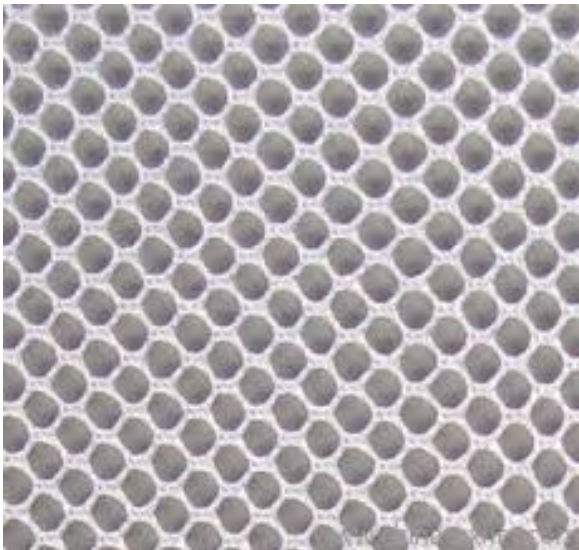
Malaria has long been a problem in Mali. But in 2006, the situation got worse: a malaria-carrying mosquito species named *Anopheles coluzzii* became increasingly resistant to common insecticides. Scientists searched for an explanation in its genes. Somehow, the species had acquired mutations that were previously only found in another species, *Anopheles gambiae* — despite the fact that these two species didn't usually mate with each other, and that their hybrids tended to die without producing offspring of their own, the mutations were identical.

Now, researchers think they know how this insecticide resistance developed. As more nets treated with insecticide were used in Mali, the mosquitoes began to develop resistance. Those once-puzzling mutations likely emerged because the nets favored the survival of



insecticide-resistant mosquito hybrids, according to a study published today in Proceedings of the National Academy of Sciences.

To find out how these mutations appeared, a group of researchers analyzed the genes of mosquitoes sampled between 2001 and 2012. They found that the variations that appeared in *A. coluzzii* started to pop up when the species began to interbreed with *A. gambiae* more often. The increase in interbreeding took place around that same time as the introduction of a health campaign in Mali, in which officials distributed insecticide-treated nets to its citizens. The researchers concluded that the nets may have driven the transfer of mutations between two species. As the hybridization rates increased, the mutations that conveyed resistance became permanently integrated in the *A. coluzzii*'s genome — a change that would made the nets less effective over time.



The hybrids were now better-adapted to the new, insecticide-net-containing environment, explains Gregory Lanzaro, a vector biologist at the University California, Davis, and one of the co-authors of the study. "So a man-made change to the environment — the use of nets — has actually driven hybridization between two species, ultimately leading to an 'improved' mosquito." That's troubling, he explains, because the nets are "one of the major malaria control strategies being used in sub-Saharan Africa."

This study doesn't definitely prove that the mutations emerged because of the increased use of insecticide-treated nets. To do that, the

researchers would have to ask that people in some villages forgo the use of the nets — a procedure that would be medically unethical — to see if it makes a difference in the prevalence of the mutation among *A. coluzzii*. Still, the researchers think they provide strong evidence for the link. There had been hybrids in the past, and they didn't lead to the spread of this mutation. That supports the idea that the mutation didn't provide a survival advantage for *A. coluzzii* prior to 2006 — or prior to the increase use of treated nets. "In fact," Lanzaro explains, "these hybrids did not survive."

Though the research team's evidence for the treated nets as a sole cause of the change isn't conclusive, "the evidence they present is very compelling," says Daniel Neafsey, a malaria researcher at the Broad Institute of MIT and Harvard University who did not participate in the study. Studies like this, he says, are "a window into the sometimes unexpected genetic processes that can erode the effectiveness of insecticides."

The findings shouldn't cause anyone to stop using nets in areas with high rates of malaria; nets are still widely considered the frontline tool of malaria control. But Lanzaro believes that there's an urgent need for new methods for malaria mosquito vector control. Scientists are exploring the use of bacteria to kill mosquito larvae, Lanzaro says. And "work is underway to use genetic methods to kill or alter mosquitoes.

Ultimately, however, the study carries a message for the health officials that promote these types of disease vector control methods, Neafsey says. Our malaria interventions are very



NEW ZEALAND BIOSECURE



successful — which was what created the mutants. "They put an enormous evolutionary pressure on mosquito populations," Neafsey says. That pressure was so pronounced that it favored breeding of two species. Which, oddly, means that nets caused a rapid, partial reversal of the evolutionary processes that led the mosquitoes to branch out into two separate species in the first place. For people who want to control insect-transmitted disease, this study should be a warning shot. Just like we already do with antibiotics, public health researchers should consider the possibility of insecticide resistance. Or as Neafsey puts it: "Evolution must be taken into account when controlling infection diseases."