THE NATIONAL EXOTIC SALTMARSH MOSQUITO SURVEILLANCE PROGRAMME

The National Exotic Saltmarsh Mosquito Surveillance Programme (NSP) aims at preventing the establishment of exotic saltmarsh mosquitoes in New Zealand. The programme is risk focused and uses novel surveillance techniques to statistically validate its findings. This article provides a brief overview of the programme and a synopsis of results for the past five years.

Background

On 24 December 1998, Aedes (*Ochlerotatus*) *camptorhynchus* (Thomson), an Australian species commonly known as the southern saltmarsh mosquito (SSM), was discovered in Napier as a result of public complaints about unusually aggressive biting mosquitoes. This species is a competent vector of Ross River virus, the cause of a debilitating disease of humans and wildlife. Ironically, it is likely to have become established just after it had been recognised (Kay, 1997) as posing a significant establishment risk. The incursion and subsequent spread to 10 other sites within the country (with the last discovery in May 2006) triggered a series of eradication programmes. The fact that *Ae. camptorhynchus* may have been present for up to four years before being discovered highlighted the importance of maintaining robust surveillance.

The cost of exotic mosquitoes establishing in New Zealand would extend well beyond the monetary costs of eradication or control: it would include the costs incurred through disease (both human and animal) and secondary health effects from infected bites. There would also be a negative effect on the quality of life, caused by the biting nuisance, and impacts on environmental health.

When SSM was first discovered, the Ministry of Health (MoH) was responsible for mosquito surveillance, with programmes predominantly targeting container-breeding species. However, saltmarsh mosquitoes principally breed in surface water, and are not generally associated with artificial or natural containers, so they were unlikely to be detected through the existing port-based surveillance programmes. Following the 1998 detection, surveillance of saltmarsh habitat outside the active eradication zones was carried out on a regional basis by Public Health Service staff. A 2002 review of the New Zealand Mosquito Surveillance Programme commissioned by the Ministry of Health (Ritchie and Russell, 2002) recommended that saltmarsh mosquito surveillance be undertaken “towards a national uniformity of approach”, and in 2005 the MoH implemented the NSP.

The NSP was managed by the MoH, with Southern Monitoring Services, New Zealand BioSecure providing the service until 1 July 2010, when responsibility was handed over to the Ministry of Agriculture and Forestry. A new company, Mosquito Consulting Services (NZ) (MCS(NZ)) took over as the new service provider.

At about the same time SSM was finally eliminated from coastal Marlborough, from north of the mouth of the Wairau River, south to Grasmere, and declared eradicated from New Zealand.

The programme

The programme used aerial surveys, ground habitat assessments and statistical modelling to provide information on the level of risk at different locations and to identify areas in need of regular monitoring (Singe *et al*., 2008). The aim was to provide early warning of the establishment and spread of exotic saltmarsh mosquitoes, and an opportunity to respond to any localised incursion, thereby avoiding the need for a nationwide eradication programme.

The programme is now conducted from the MCS (NZ) headquarters, located in Lower Hutt with satellite offices in seven other locations throughout New Zealand. The key objective of the NSP is to deliver a robust surveillance programme that provides consistent best practice surveillance activities for the early detection of exotic saltmarsh mosquitoes throughout the country.

Methodology

Ground surveillance consists mainly of sampling by dipping into inundated habitat to remove water samples and removing any larvae present for identification (**Figure 1**). Success of this technique depends on the sampling officer’s expertise as the chances of detecting larvae are greatly affected by choice of dipping location and dipping technique.

Figure 1: Larval dipping in salt-affected habitat.

Well executed larval surveillance provides the highest likelihood of early detection, but some light trapping of adult mosquitoes is also done. Light and chemical traps (**Figure 2**) are used around likely mosquito habitat. These traps emit CO_2 and octenol as mosquito-specific chemical attractants, and light as a general insect lure. Mosquitoes enticed close to the trap fly under the sheltered area near the light and are blown down into a collection pot from which they are retrieved for identification. When dipping or trapping the field officer also functions as a mosquito lure and attempts to collect any mosquitoes seen, using an aspirator.

Figure 2: A light trap placed near potential saltmarsh mosquito habitat.

Planning site visits

Environmental conditions and season are considered when planning surveillance activities. Variations in rainfall and tidal range affect the amount of suitable habitat available for exotic mosquitoes, and influence the amount of time officers spend in the field in each area at any time. Most field operations are conducted by staff who are local to the area and therefore familiar with recent environmental conditions.

Data collection and storage

All ground surveillance activities are recorded using GPS units and tracking software as well as digital cameras that record voice annotations with each image. Data are downloaded on return to base and each day's track images and data records are reviewed and stored. Digital photographs and voice annotations are linked to the track, providing a historical record of each site and the ability to pictorially review site conditions over time. Also recorded are landowner details, surveillance effort and history, track logs of sites visited, conditions and habitat, weather, habitat modifications, specific environmental events likely to trigger egg hatching, and identifications of specimens.

The NSP is re-developing its database to incorporate all surveillance information in one viewable location. This will provide a record of all surveillance since the beginning of the NSP, and will be accessible through the internet.

Results

During five complete years (2005–2010) about 40 000 larvae and more than 18 000 adults have been collected throughout New Zealand, including the Chatham Islands.

Detection of *Ae. camptorhynchus* from the Coromandel Peninsula, in high-quality habitat, provided strong validation of the new surveillance protocol as larvae there were present at much lower densities than had been typically the case in earlier detections. This indicates early detection was achieved and enabled response operations to focus on a relatively small incursion.

In August 2007 three unusual larvae were collected in from swampland on the Chatham Islands. They were identified as an unknown *Aedes* species within the subgenus *Ochlerotatus*. Australian experts were consulted and agreed this appeared to be a new species. Light traps were deployed during two trips to the islands, and adult specimens that were also not of any known species were collected. Taxonomic descriptions of both life stages are now underway.

REFERENCES

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Mark Disbury
Noelle Fynmore
Darryl McGinn
Mosquito Consulting Services (NZ)
PO Box 38-328
Lower Hutt 5010
mark.disbury@mcspty.com

Rachel Cane
Mosquito Consulting Services (NZ)
PO Box 69-198
Lincoln 7608