Exotic mosquito detected in domestic port area in Darwin

Nina Kurucz, Medical Entomology, Centre for Disease Control, Darwin

Abstract

On 6 May 2018 an adult male mosquito was hand caught by the Commonwealth Department of Agriculture and Water Resources during a routine inspection of a vessel arriving at Darwin’s Stokes Hill Wharf from Papua New Guinea. Following the inspection, the vessel was granted coastal status, and subsequently moved to Fisherman’s Wharf to unload cargo and the Duck Ponds to await further domestic deployment. The mosquito was tentatively identified as the dengue mosquito, *Aedes aegypti*. The vessel having visited domestic wharf areas in Darwin, without the actual *Ae. aegypti* breeding site located, triggered precautionary mosquito surveillance and control measures at all 3 wharf areas, and a subsequent vessel inspection, during which a live female *Ae. aegypti* was collected on deck of the vessel. The situation was up-scaled to ‘high risk’, with the response escalated to a comprehensive detection response as per the Commonwealth Department of Health’s ‘Response Guide for Exotic Mosquito Detections at Australian First Points of Entry’.8 The guideline outlines stakeholder’s responsibilities, as well as protocols for enhanced mosquito surveillance and control inside the 400m quarantine zone, based on the circumstances of the detection.

In May 2018, an adult *Ae. aegypti* male was caught by hand during a biosecurity inspection on a vessel arriving from Papua New Guinea, that docked at Darwin’s domestic Stokes Hill Wharf. This article outlines the circumstances and response to the detection.

Exotic mosquito detection and identification

On 6 May 2018, a Darwin based vessel arrived at Darwin’s Stokes Hill Wharf following 6 months work around Port Moresby, Papua New Guinea. On arrival it underwent a routine biosecurity inspection by DAWR. A live mosquito was detected and hand caught in a below deck cabin.

As no further mosquitoes or receptacles breeding mosquitoes were detected during the initial inspection, the vessel was granted coastal status, after which it moved to the domestic Frances Bay area in Darwin (Duck Ponds) overnight, before it relocated to Fisherman’s Wharf on Monday to unload cargo, and returned to the Duck Ponds awaiting further domestic deployment (Figure 1). The unloaded cargo was delivered to a premise in Winnellie on Monday 7 May.
The mosquito was delivered to ME for identification on 6 May, with the identification process finalised on Tuesday 8 May. Due to the damaged state of the specimen, it was tentatively but with a high degree of certainty, identified as *Ae. aegypti*.

**Initial response to exotic mosquito detection**

As per the ‘Response Guide for Exotic Mosquito Detections at Australian First Points of Entry’ exotic mosquito detections on vessels only, do not require enhanced surveillance. However, to mitigate any risk of an undetected dengue mosquito having escaped the vessel in a Darwin domestic wharf area, precautionary measures were implemented on 9 May. These measures included; a larval mosquito survey, treatment of all receptacles holding water, mosquito barrier spraying and setting of mosquito traps. The work was carried out by ME and DAWR for a limited time at Stokes Hill Wharf, Fisherman’s Wharf and the Duck Ponds using Biogents sentinel traps (BG), sticky traps and ovitraps and the insecticides Temprid 75® (active constituent: beta-cyfluthrin and imidacloprid), Bithor® (active constituent: bifenthrin and imidacloprid) and methoprene.

In addition to the surveillance and control measures, the unloaded cargo was re-inspected by DAWR in Winnellie, with the vessel also re-inspected by ME and DAWR on 9 May. While no issues were identified with the cargo a number of dead mosquitoes were found inside wooden storage containers found under the below deck cabin beds. These included a male *Ae. aegypti* mosquito, a female *Mansonia papuensis*, which occurs in Papua New Guinea but is not related to human disease, and a possible *Culex quinquefasciatus* (damaged). The finding of most concern however, was a live mosquito, which was hand caught while hovering around the outside door on deck of the vessel. Following positive identification of the mosquito as a freshly hatched female *Ae. aegypti*, the situation was escalated to ‘high risk’ due to the possibility of additional dengue mosquitoes having escaped the vessel and a still undiscovered breeding site. In response to the detection, the precautionary measures in place were increased to a fully comprehensive response in line with the Commonwealth Department of Health’s ‘Response Guide for Exotic Mosquito Detections at Australian First Points of Entry.’

**Comprehensive response to additional dengue mosquito detection**

While no further barrier control or larval surveys were required in the 3 wharf areas, the number of enhanced surveillance traps were increased and all ovitraps replaced with sticky traps as per protocol on 10 and 11 May. A total of 5 BG traps and 13 sticky traps were part of the enhanced surveillance (Figure 2). On 9 May, port management were informed of the requirement to carry out adult mosquito control (fogging) on all 3 wharves the following night. To allow fogging to proceed, Stokes Hill Wharf was closed to the public. Commercial premises at Fisherman’s Wharf, along with private and commercial vessel owners at the Duck Ponds were informed of the operation. Vessel owners received notification via e-mail
Figure 2. Location of enhanced surveillance traps in Darwin wharf areas

Figure 3. Tub on board of the vessel breeding Ae. aegypti

and through distribution of an information flyer. Fogging was carried out by ME between 6 pm and 9:30 pm on 10 May, using Twilight® (active constituent: phenothrin and piperonyl butoxide) (Figure 1).

To eliminate the vessel as a source for further exotic mosquitoes, it was accessed and insecticide treated on 10 May. Temprid® was applied externally to ensure any resting mosquitoes on treated surfaces would not survive. During the operation the cryptic mosquito breeding site on deck of the vessel was finally detected, with 29 x 4th instar, 3 larval skins, 22 pupae, 10 pupal skins (unidentifiable) and 11 larval mosquito capsules (unidentifiable) detected in an upside down tub with hidden indentations holding water (Figure 3). Of the specimens collected, 29 larvae, 2 larval skins and 14 pupae were confirmed as being Ae. aegypti, and another 7 pupae also highly likely Ae. aegypti. One pupae was identified as the endemic mosquito Ae. notoscriptus, while the 10 pupal skins collected were most likely Ae. aegypti considering the high number of Ae. aegypti pupae. Fumigation of the container was ordered by DAWR on 10 May. As fumigation with methyl bromide had not occurred immediately, a preliminary treatment of the container using a chlorine/detergent mix to kill potential mosquito eggs was undertaken followed by Temprid® to prevent further mosquito breeding.

To ensure that no female Ae. aegypti had deposited eggs in receptacles holding water on board any vessel moored at the Duck Ponds since 6 May, permission to inspect vessels from vessel owners was obtained with assistance from port management. The majority of vessels were inspected on 10 May, with the remaining vessels inspected over the next few days. No evidence of exotic mosquito breeding was found and only 1 vessel was breeding endemic mosquitoes.

Finally, to ensure that no Ae. aegypti had escaped the wharf areas and moved into adjacent residential areas, 9 ovitraps were established and serviced for 6 weeks at the outer parameter of nearby residential areas.

As per protocol, all enhanced surveillance traps were serviced daily for 1 week, every 2nd day the following week, and once a week for a period of 4 weeks.
Discussion

Following the initial detection of *Ae. aegypti* on board the vessel and the subsequent detection during the follow up inspection, no further exotic mosquitoes were detected. This exotic mosquito detection showed the importance of biosecurity inspections on international vessels, as without such inspections, exotic mosquitoes would remain undetected and could establish populations in the NT resulting in possible dengue outbreaks. This detection particularly emphasises the threat to the NT through importations of exotic mosquitoes breeding in cryptic, and thus undetected, breeding sites. If the initial adult mosquito had not been detected in the cabin, it is highly likely that subsequent hatches of dengue mosquitoes would have occurred in the Darwin domestic port areas, and the mosquitoes only detected much later in routine surveillance traps. In addition, undetected breeding around the port area could have led to receptacles with dengue mosquito eggs being transported to other areas in the NT, making dengue mosquito elimination very costly and difficult, or potentially impossible.

Following this detection, the cooperation between all stakeholders needs to be commended, as it enabled an immediate response to the threat. Of note was the positive response of all private and commercial vessel owners in granting permission for timely vessel inspections, and the support and assistance of port management and businesses. As the exotic detection breached the 400m quarantine zone the close collaboration between DAWR and ME was a vital component in the success of the response.

Acknowledgements

We would like to acknowledge and thank all ME and DAWR staff, port authorities, business and vessel owners involved in the exotic mosquito surveillance and control response for their support at Stokes Hill Wharf, Fisherman’s Wharf and the Duck Ponds.

References