Introduction

Northern Australian seaports are considered the most at risk ports to exotic mosquito introduction in Australia. Northern Territory (NT) seaports, such as those in Darwin and Nhulunbuy are especially vulnerable since they tend to be the first port of call for international seagoing vessels including cargo vessels, foreign fishing vessels, refugee boats and yachts. These vessels have the ability to harbour and transport exotic mosquitoes as eggs, larvae and or adults in drinking water receptacles such as large drums, jerry cans and any artefacts that have the capacity to hold water including tarpaulins, machinery, equipment, and vehicle tyres.

The Australian Quarantine Inspection Service (AQIS) conducts inspections of all seagoing vessels and cargo to detect and eliminate any importations of exotic vectors. The Medical Entomology Branch (MEB) of the Centre for Disease Control, NT Department of Health and Community Services, also conducts routine surveillance for exotic mosquito introductions by trapping for adult mosquitoes and egg laying occurrences using ovitraps. In addition, precautionary ground surveys and treatments for receptacles in and around the 400m-quarantine containment zone that have the potential to harbour and breed mosquitoes are undertaken at the start of each wet season. During a routine cargo pre-clearance inspection in April 2007, an AQIS officer found larval mosquitoes present in water pooling in the structures of cable drums. This report details the detection and elimination measures implemented after this detection.

Detection

On the morning of the 3 April 2007, an AQIS officer conducted a pre-clearance inspection of cargo that had arrived from Singapore on the previous day and had been unloaded onto Perkins International Shipping Wharf in the Darwin Port area. The cargo consisted of 27 loose 30 tonne cable drums (Figure 1), all of which held water or had been holding water at some stage. Water was seen collecting in the spokes (Figure 2) of the drum structures and pooling on the centre axil surface (Figure 3). Total water volume held by each cable drum varied with a maximum water volume estimated to be up to 5 litres. The AQIS officer commented that while the cable drums were unloaded from the ship onto the wharf, water held within the drum structures were seen spilling out.

A preliminary identification of samples was conducted at AQIS laboratories with the larvae identified as belonging to the Aedes scutellaris group. These were confirmed as Ae. scutellaris group, probably Aedes albopictus (Skuse) species by a medical entomologist at the MEB on the same day of collection. The diagnostic features of the larval specimens were found to be at variance with published descriptions, similar to that found by Lamche and Whelan (2003), with one aberrant specimen having the appearance of Aedes pseudoalbopictus.

Of the 27 cable drums, 2 were positive for mosquito larvae, which consisted of five larvae and 1 pupa. The mosquito samples were collected from the spokes of the drum structures and preserved in 70% alcohol on site. No flying adult mosquitoes were observed.

A MEB follow up site survey of the cargo for possible pupal skins to indicate the possibility of adult emergence and dispersal, resulted in the collection of 2 more 2nd instar larval specimens from the spokes of a cable drum, but no pupal skins. Thus, a total of 3 cable drums were positive with 7 larvae and 1 pupa. The 2nd instar larvae were reared in the MEB insectary to the 4th instar and then through to the adult stage in a secure rearing capsule. The emerged single female and single male adult specimens were confirmed as Ae. albopictus.

The presence of a single male pupa and a small number of larvae indicate a low to moderate importation risk. For Ae. albopictus eggs hatched as a batch, male mosquitoes tend to emerge before female mosquitoes, thereby enabling them to be ready for flight and to copulate with newly emerged females. Although no pupal skins were collected from the water in the cable drum spokes, the water that had been
displaced while loading the drums onto the wharf could have contained more larvae, pupae or pupal skins. Therefore, possible adult emergence could not be discounted.

Elimination Procedures

After the AQIS and MEB samples were collected from the cable drums, a chlorine treatment of the water was performed and a spray of Perigen® 500 (active ingredient: permethrin 500g/L) was applied by an AQIS approved pest control contractor to all surfaces capable of holding water when rotated. This was an interim measure to kill any possible larvae or pupae remaining in the water contained on the cable drums until fumigation of the 27 cable drums for possible eggs could be conducted.

A precautionary adulticide fogging operation was conducted by MEB on the evening of 3 April. Perkins Shipping and the neighbouring industrial premises, Frances Bay Marine, were fogged (Figure 4) using an Ultra Low Volume (ULV) LECO fogging machine with an application of bioresmethrin at a ratio of 1:1.5 insecticide to diesel, and at a rate of 330ml per minute. All Perkins personnel were absent excluding security personnel. The Perkins shipping area, including the engineering yard and sheds and building areas that could be accessed, was fogged from between the hours 18:30 to 19:10 and 19:27 to 19:44. The next-door premise, Frances Bay Marine, was fogged between 19:14 and 19:23.

Surveillance

Adult mosquitoes

One routine Encephalitis Virus Surveillance (EVS) adult mosquito trap and 2 extra EVS adult mosquito traps A and B were set by AQIS on a weekly basis from the 12 April to 10 May within the Perkins Shipping compound to monitor for possible adult Ae. albopictus presence (Figure 5). The traps did not pick up any adult Ae. albopictus, but did suggest the presence of a possible breeding site for exotic mosquitoes as indicated by 12 adult Culex quinquefasciatus in the Perkins EVS trap A.

Figure 1. Quarantined cable drum

Figure 2. *Ae. albopictus* larvae found in water pooling in spokes

Figure 3. Central axle holding water

Three to 4 cable drums at a time were covered and fumigated by a contract pest controller with methyl bromide for 24 hours at 48g/m3 at 21° or above from 4 April over a one-week period.
Larval

Previous recent ground surveys and treatment of mosquito breeding receptacles in the Perkins Shipping yard by AQIS and the MEB found Cx. quinquefasciatus breeding in water holding receptacles such as tyres that were used by Perkins and Frances Bay Marine as cushioning devices. These may be the possible source of the adult Cx. quinquefasciatus found in the EVS adult mosquito traps.

Ovitrap

The operation of routine AQIS and MEB ovitraps (Figure. 5) was seen as sufficient for the risk level present. No Ae. albopictus were detected within the ovitraps collected from the Perkins shipping area for the next 2 months.

Conclusion

The elimination procedures and increased surveillance efforts outlined above were deemed appropriate to conclude that there was no establishment of Ae. albopictus from this importation.

If there were any adult mosquito survivors from this importation, the routine adult monitoring trapping and ovitraps set in the area are considered adequate to detect any subsequent establishment after the start of the next wet season. A precautionary ground survey and treatment round will be conducted at the beginning of the wet season around November by AQIS and the MEB.

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References


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