Occurrence and distribution of *Aedes albopictus* (Skuse) in the Netherlands; survey 2006-2007.

Project conducted on behalf of the Ministry of
Public Health, Wellbeing, and Sports

Report

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Contents

Summary

In the summer of 2005, the Asian tigermosquito (*Aedes albopictus*) was found for the first time in the Netherlands. It was intercepted in several horticultural companies that import the ornamental plant Lucky bamboo from southern China, an endemic area for this mosquito species. The current report describes the results from a one-year survey that was carried out to study the distribution of *Ae. albopictus* in the Netherlands (July 2006-June 2007). Since the presence of this species is directly linked to the continuous import of Lucky bamboo the focus of the survey was aimed at these companies. In total, 542 specimen were collected with mosquito traps from 15 (out of the 17) Lucky bamboo-importing companies. Additionally, a total of 57 specimen of the species were collected manually, and a total of 58 larvae. On two occasions there was prove that *Ae. albopictus* escaped from the company's premises. In one of these cases apparently large numbers had escaped and caused severe biting nuisance in a neighbouring area. Although *Ae. albopictus* mosquitoes were collected throughout the whole study period, far less specimen were collected during the second half of the survey (January 2007 – June 2007), than during the first half. Also, the number of infested companies was smaller during the second half of the survey period.

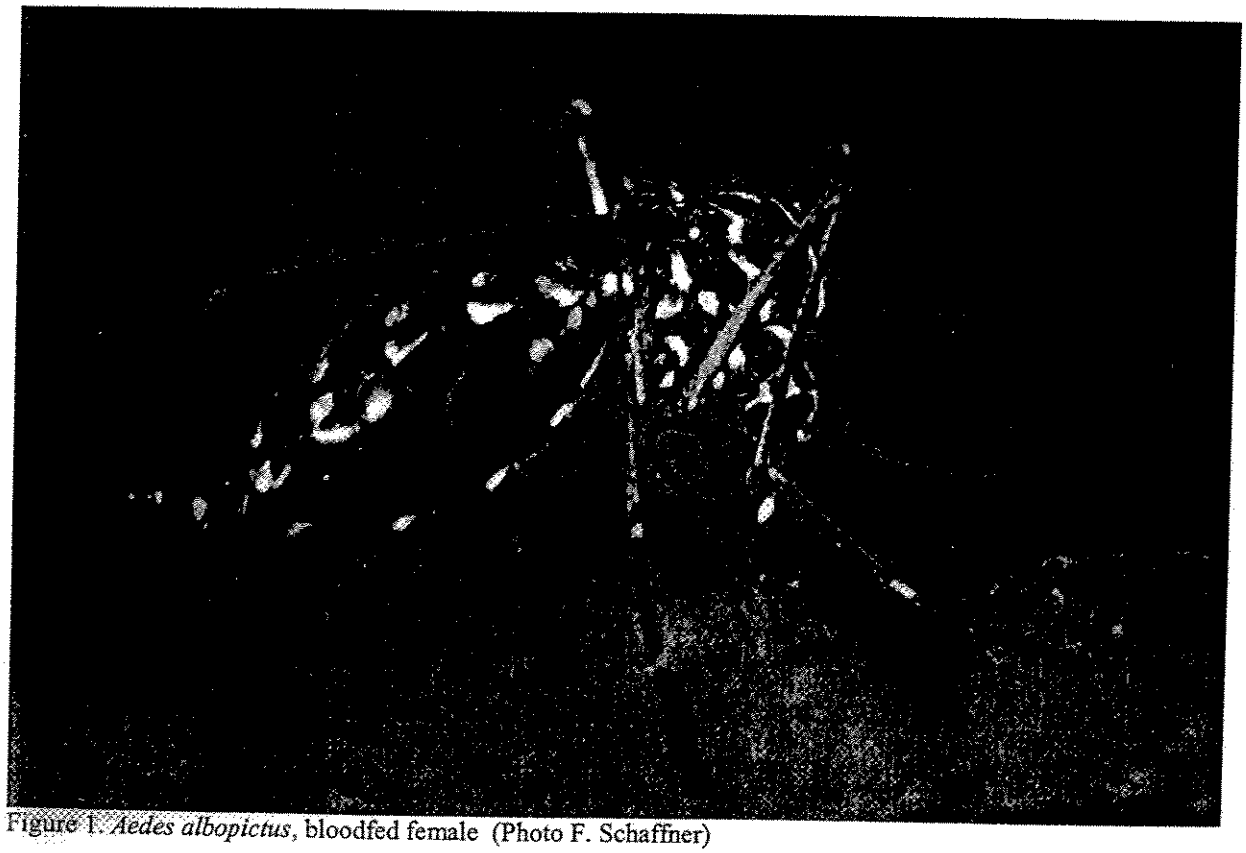

Figure 1. *Aedes albopictus*, bloodfed female (Photo F. Schaffner)

1. Introduction

In July 2005, *Aedes albopictus* (Diptera: Culicidae) mosquitoes were found during routine fytosanitary inspections of the Plant Protection Service in greenhouses in the municipalities of Haarlemmermeer and Aalsmeer. The insects were introduced through the importation of these ornamental plants from South-East China. *Ae. albopictus* is a vector for a wide range of arthropod-borne (arbo) viruses including those that cause dengue, Japanese encephalitis, West Nile, and Chikungunya. The import originated from an area in Asia were arbovirus infections do occur. Although surveillance data from China are sparse, dengue virus is considered to have the highest incidence in the region mentioned.

Based on these facts, concerns were raised and an advice was formulated by the National Centre of Infectious Disease Control (Cib) to the ministries of LNV, VWS and VROM to finance a multi-disciplinary study to assess the potential risks of the introduction of these mosquitoes to human health in the Netherlands. The proposed joint study addressed four distinct questions: 1) what is the occurrence and distribution of *Aedes albopictus* in the Netherlands? 2) what is the likelihood for establishment of this species in the Netherlands? 3) Are the introduced mosquitoes carrier of dengue virus? and 4) Are there indications that dengue virus has been transmitted to exposed employees of the Lucky bamboo importing companies and PD inspectors of those companies? By June 2006, the proposed study was financed by the ministry of Public Health, Wellbeing, and Sports (VWS), and the above questions were carried out by the Plant Protection Service (question 1), Wageningen University (q. 2), and the National Institute for Public Health and the Environment (q. 3 and 4). The latter institute also coordinated the study.

Between July 2006 and July 2007, the Plant Protection Service (henceforth called PD) carried out the survey to study the occurrence and distribution of *Ae. albopictus* in the Netherlands. The current report describes the set-up, and analyses the results from this study.

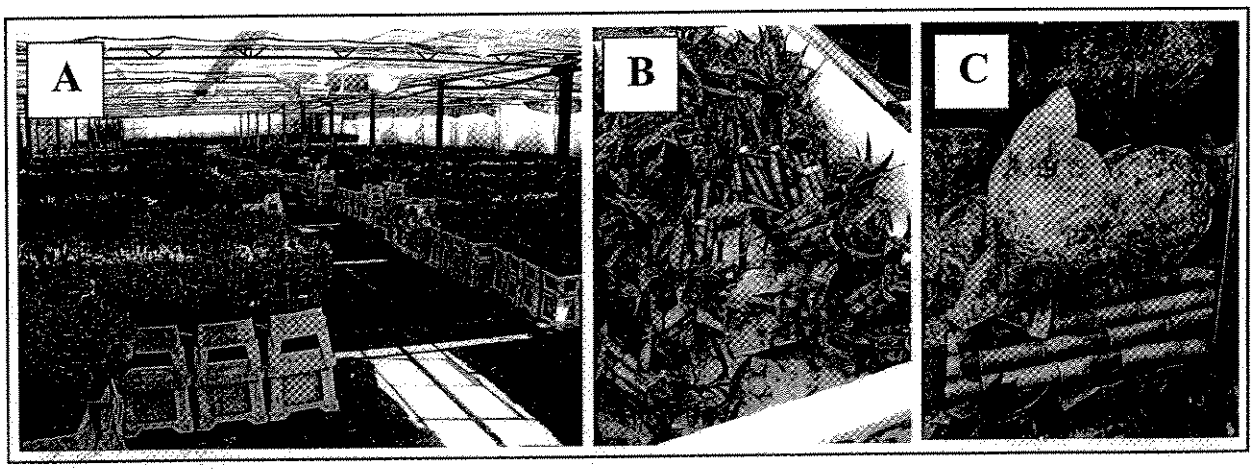

Figure 2. A) The glasshouse of a Lucky bamboo-importing company. The plants are transported from southern China with the roots either 'on water' (B), or 'on gel' (C).

2. Materials and Methods

Set-up of the survey

Since the introduction pathway of the Asian tiger mosquito into the Netherlands was linked directly to the import of Lucky Bamboo from an *Ae. albopictus* endemic area rather than to import through used tyres or road traffic, the focus of this survey was on Lucky Bamboo importing companies.

2.1 Mosquito traps at Lucky bamboo importing companies:

The standard method used to verify the presence or absence of *Aedes albopictus* in an area is by means of oviposition traps: these are small cups containing water and a piece of material used by gravid *Ae. albopictus* females to lay eggs on. However, since the introduction-pathway of this species into the Netherlands was linked to the import of Lucky Bamboo plants and artificial oviposition sites (mostly transport and plant storage boxes containing a bottom of water) are extremely abundant in companies that import these plants, oviposition traps were considered to be unlikely in 'betraying' the presence of the species at these companies (See Figure 2). Instead, it was decided to focus on the presence of adult specimen of the species rather than of eggs. For that purpose, 'counterflow' carbondioxide-baited mosquito traps (Mosquito Magnet, type 'Liberty Plus', American Biophysics®) were used. These traps make use of the fact that biting mosquitoes (Culicidae) are attracted to carbon dioxide, a non-species-specific gas eminated by e.g. mammals. Per Lucky bamboo-importing company, one trap was placed in the glasshouse area amidst the Lucky bamboo plants. At the start of the survey there were a total of 16 of such companies known to the PD. Halfway the survey yet two other companies surfaced. One of these companies was included in the study, but due to the tight budget and the impractical logistics if the second company were to be included in the study, it was decided with the principle coordinator of the joint study not to incorporate this second company in the survey. Traps were run continuously throughout the survey. Nets were emptied every two weeks and sent to the 'National Reference Laboratory for Fytosanitary Pest and Diseases' (henceforth called 'the laboratory') of the PD for identification.

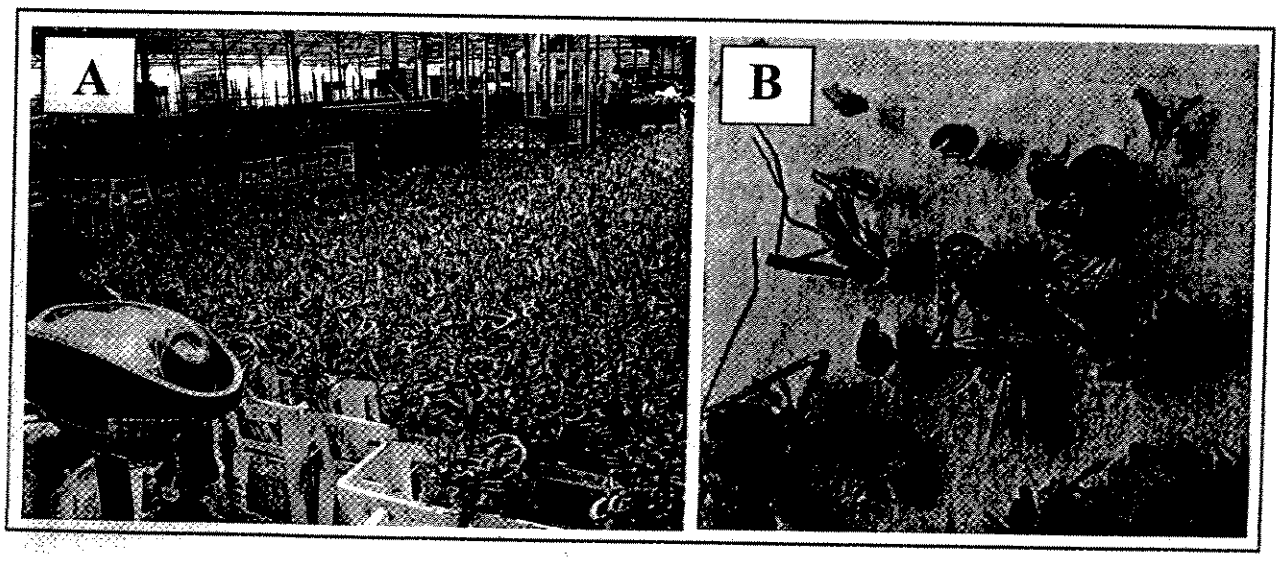

Figure 3. A) The mosquito trap, 'Liberty Plus' at one of the Lucky bamboo importing companies. B) Four *Aedes albopictus* specimen, collected from the trap

2.2 Mosquito traps at other locations:

In order to assess the possibility that active flying *Ae. albopictus* in a Lucky bamboo importing company could leave the glasshouse and fly to neighbouring areas, two locations were selected where other traps were positioned near a Lucky bamboo importing company. In one case (trap nr. 1), the trap was placed outdoors at the premises of a neighbouring company that did not import Lucky bamboo, close to the company where trap nr. 3 was positioned. In the other case, two traps (trap nrs. 18 and 19) were placed in two different glasshouses of companies that had never imported or stored Lucky bamboo. Both glasshouses neighboured, on opposite sites, the same Lucky bamboo importing company that had been found positive for the presence of *Ae. albopictus* (where trap nr. 10 was located). The distance of these glasshouses to the Lucky bamboo importing company was approximately 10 meters. A third trap (trap nr. 20) was placed some 50 meters away from the same Lucky bamboo importing company in the private garden of a family.

2.3 Presence of larvae:

Inspectors of the PD carrying out the survey were instructed not only to change the net of the traps, but also to keep their eyes open to suspicious situations, such as the presence of mosquito larvae. Collected larvae were sent to the laboratory of the PD where they were kept until the adult stage emerged, which were then identified.

2.4 Manually collected adult mosquitoes:

In addition, to verify mosquito biting nuisance complaints of employees on Lucky bamboo importing companies, the inspectors were also instructed to search for, and collect flying mosquitoes in these companies. For that purpose they were equipped with suction tube and a standard collection net during their inspections.

2.5 Sightings by the public:

After ample press coverage of the presence the alleged Asian tiger mosquito in the Netherlands, reports started to come in at the RIVM as well as the PD from people all over the country who claimed to have spotted this 'tigermosquito'. They were asked to make detailed macro-pictures with a digital camera, to be sent by email to the PD where an entomologist had a first impression of the species. When the photographed mosquito was suspected to be *Aedes albopictus*, the person was asked to sent the mosquito to the PD laboratory for proper identification. When no pictures were/could be taken, experts of the PD paid a visit to the caller to investigate the report more in detail.

2.6 Biting nuisance

PD inspectors carrying out the collections from the traps were instructed to ask employees at the companies if they had experienced nuisance from mosquito bites during the last two weeks. Occasionally, when large numbers of *Ae. albopictus* were present at a company, the inspector would venture into the direct neighbourhood to ask neighbours if they experienced mosquito biting nuisance. In one case, a family living close to a Lucky bamboo importing company complained about excessive mosquito bites. In order to verify what species were responsible for this nuisance, a trap was placed in the garden of this family for the duration of 4 months.

2.7 Insecticides

PD inspectors were also instructed to gather information about the use of insecticides at the Lucky bamboo importing companies; choice of insecticidal product, when was it applied, the reason for using the product, and if the application had helped reduce biting nuisance.