Asian bush mosquito

(*Aedes japonicus*)

Managing the Asian bush mosquito in Natoye

(Wallonia, Belgium)

Wallonian interdepartmental group against invasive species (CiEi)

■ Since 2009, the CiEi has been responsible for coordinating efforts to limit the damage caused by invasive species in Wallonia. If federates three departments of the Wallonian public service, namely the Natural environment and agriculture department (DEMNA), the Nature and forests department (DNF) and the Rural and rivers department (DRCE).

■ The main missions of the CiEi are to:

- implement the European regulation 1143/2014;
- set up preventive measures and adapt the regulatory framework as needed;
- coordinate operations against invasive alien species;
- develop an alert system;
- improve knowledge on the species,
- inform managers and the general public.

■ Contact : invasives@spw.wallonie.be

Avia-GIS

■ Avia-GIS is a private Belgian company (SME) founded in 2001 and specialised in collecting, processing and analysing spatial data used to develop space and time-based information systems in the fields of veterinary and public health. It works specifically on emergent zoonoses and vector-borne diseases.

■ The company strives to optimise information systems on health issues and to propose management techniques for pests.

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Intervention site

■ The Asian bush mosquito has now spread to several areas in Europe and its range grows each year.

■ It was first discovered in Belgium in 2002, on the storage site of a company that imported used tires, located in the village of Natoye (town of Hamois, Namur province).

■ The village lies in the basin of the Meuse River and in the "Vallée du Bocq" Natura 2000 zone (BE35010).

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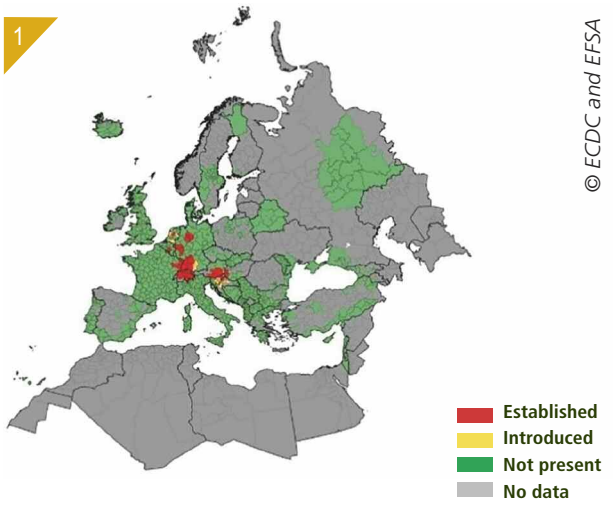

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1. Distribution of Asian bush mosquitoes in Europe in 2017.
2. The village of Natoye in Belgium.

In the Natura 2000 zone, there are eight sites of high biological value, the equivalent of ZNIEFF sites in France, that include former quarries, hay meadows, megaphorbias, pools and ponds, etc.

■ The monitoring campaigns run over the following years (MODIRISK project from 2007 to 2010 and the project of the Institute for tropical medicine in 2011 and 2012) confirmed the presence of the insect and indicated only limited expansion from the introduction site.

■ An initial campaign to eliminate the population was carried out in 2012. The colonised sites that had been detected were treated with a highly specialised bacterial insecticide, *Bacillus thuringiensis* var. *israelensis* (Bti).

■ Subsequently, following an initiative by the Wallonian

Environmental ministry, a more structured campaign against the Asian bush mosquito was launched in Natoye from 2013 to 2015, in view of reducing the environmental and health risks arising from the installation of the species. This was the first time that such a large project against mosquitoes was undertaken in Belgium.

■ The intervention took place over a zone spanning approximately 30 square kilometres around two colonies detected in Natoye. The towns of Hamois and Ciney were major participants in the monitoring and work. Additional inspections were also carried out in the nearby towns.

3. A pile of tires stored in the open air where rain water stagnates, providing a particularly favourable environment for the development of the mosquitoes.

Disturbances and issues involved

■ The bite of an Asian bush mosquito is more painful than that of the native mosquitoes. In addition, contrary to the native mosquitoes that generally bite at night and inside homes, the Asian bush mosquito bites primarily during the day in gardens and wooded areas.

■ It is not considered a major vector of disease, either in its original range or where it has since been introduced. However, laboratory tests have shown that it is a potential vector of several viruses, including dengue fever and chikungunya.

■ In Europe, the Asian bush mosquito may currently be the vector of a single virus, namely the West-Nile virus. To date, the latter virus has not been detected in Belgium in either native or alien mosquitoes.

■ The Asian bush mosquito is likely to compete with the native mosquitoes that develop in holes in trees, e.g. *Aedes geniculatus* and *Anopheles plumbeus.*

Interventions

■ Discussions with other stakeholders and partners

■ The project manager, the Wallonian public service (SPW), put Avia-GIS in charge of the technical support and logistics. The other partners in the project were the towns of Hamois and Ciney, the Haute-Meuse river board, the Namur Province and the permanent Environment and health group.

■ Objective of the interventions

■ The objective was to precisely map the distribution of Asian bush mosquitoes around Natoye and to eradicate them.

■ The map of mosquito distribution was prepared in 2013. Two risk zones were identified:

- a high-priority zone within 1 500 metres around the central point (centroid) of the introduction area;
- low to moderate-priority zones in two nearby areas.

■ Time line of the interventions

■ The work took place each year from May to October, in 2013, 2014 and 2015.

■ In 2014 and 2015, the work focussed on the areas where the species was detected in 2013. With the exception of four urban areas in the towns, the intervention took place essentially in wooded areas.

■ Monitoring was organised in 2016 to check the effectiveness of the work.

■ All of the field work, from the planning of the monitoring activities to the mapping of the detected colonies, was done with the assistance of the VECMAP software (www.vecmap.com), developed by Avia-GIS for monitoring and mapping the vectors of diseases.

■ Intervention steps

■ Inspections were run on all the potential sites for larvae (small water bodies, recipients, holes in trees, etc.) in the high-priority zone. The larvae were identified by the experts from Avia-GIS and positive sites for *Aedes japonicus* were destroyed (removal of objects and equipment, filling of natural sites with soil or sand) or treated with a biological insecticide.

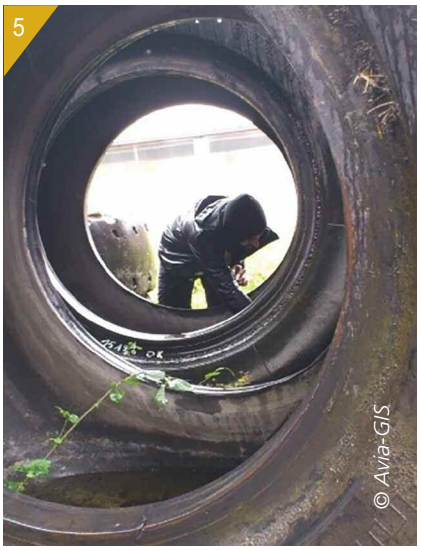
■ Egg traps (or sentinel traps) were laid in the targeted zones (gardens in the urban areas, farms, wooded lots and roads). This type of trap consists of a black pot, one to three litres in size, filled with water and a floating square of polystyrene, approximately 5 x 5 cm, that serves as an attractive laying spot for mosquitoes. The eggs do not develop if they are not covered by a rising sheet of water. This system makes it easy to remove the polystyrene and count the number of eggs in order to evaluate the local population of the mosquito species in question. The eggs were identified genetically.

■ In the low and moderate-priority zones, the same work was done, but with a lower sampling rate for traps and larval sites (50% sampling rate in the moderate-priority zone and 25% in the low-priority zone).

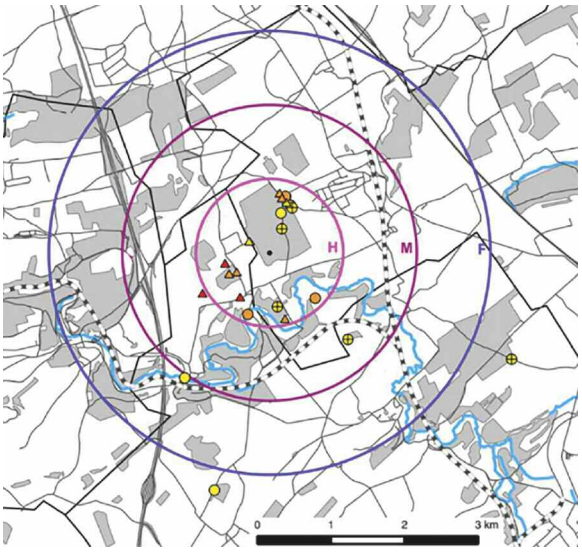
■ Efforts to raise awareness

■ In order to eliminate a maximum number of larval sites, efforts were made to raise the awareness of the local population.

■ Avia-GIS provided training to municipal employees, the agents of the Wallonian public service and the agents of the Haute-Meuse river board on how to detect larval sites and to install egg traps.



4, 5. Collecting larvae in tires.



○	Positive ET in 2014
⊕	Suspected positive ET in 2014
○	Positive ET in 2013
△	Positive LS in 2014
△	Positive LS only in 2013
▲	Positive LS only in 2012
●	Centroid
	1 000 m buffer zone
	2 000 m buffer zone
	3 000 m buffer zone
	Railroad
	Roads
	Water
	Towns
	Forests

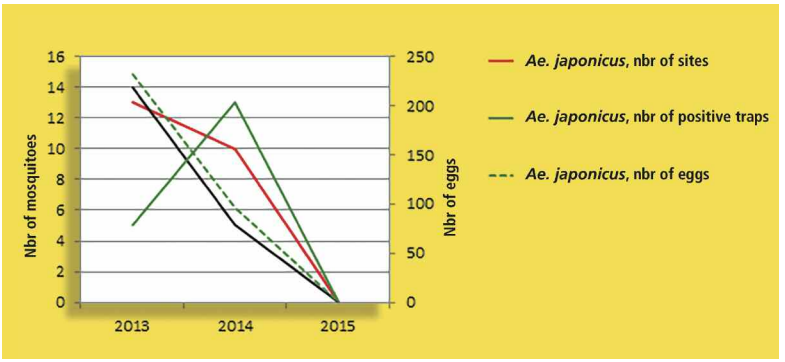
Zone monitored in 2014 with three priority levels around the introduction site. (ET = egg trap, LS = larval site)

Results and costs

Results

- During the management work, ten distinct colonies of the Asian bush mosquito were detected.
- In 2013, the sites were treated where the presence of the mosquitoes had been confirmed. The sites at risk were treated preventively and closely monitored. In a circle (radius 4 km) around the known sites, the forests, river banks, roads, trails, farms and 131 properties in the Natoye urban area were all carefully inspected. The Asian bush mosquito was found on 13 larval sites and in five egg traps, where a total of 231 eggs were collected.
- In 2014 and 2015, the campaign was repeated in order to maintain the pressure on the species. Given that no mosquitoes were observed in the surrounding areas, the monitoring effort focussed on the sites where they were observed in 2013 and in the zone at risk of dispersal. In 2014, the Asian bush mosquito was detected on ten larval sites and in 13 egg traps, with 97 eggs collected. In 2015, no traces of the mosquito were detected on the sites or in the traps.
- From 2013 to 2015, the populations of other mosquito species declined in parallel with the number of Asian bush mosquitoes detected.
- In 2016, the Wallonian public service monitored eight sites within a 3-kilometre radius of the initial site, however, the Asian bush mosquito was not detected.
- The fact that no Asian bush mosquitoes were detected in 2015 and 2016 confirmed that the management campaign succeeded in eliminating them completely from the monitored zone.

6. Egg trap.



Changes in the number of larval sites and traps indicating the presence of Asian bush mosquitoes, and in the number of collected eggs, from 2013 to 2015.

Costs

- The operation required a total of 146 man-days in the field.
- The total cost amounted to 133 917 euros for the interventions over three years.

Breakdown of human resources invested each year (man-days).

Year	Forest workers	Municipal workers	Water management (SPW)	CiEi	Avia-GIS
2013	19	14	7	9	22
2014	7	5	5	5	14
2015	7	5	5	5	14
2016	-	-	-	3	-
TOTAL	33	24	17	22	50

Total costs per year.

Year	Cost (€)
2013	59 367
2014	44 607
2015	29 942
2016	-
TOTAL	133 917

Information on the project

- The residents of the two towns were encouraged to participate via distributed letters and documentation.
- The Wallonian public service prepared a web page dedicated to the Asian bush mosquito that has been accessible to the public since March 2013 (http://biodiversite.wallonie.be/moustiquejaponais).
- A brochure titled “Mosquitoes - Simple measures to avoid their proliferation in our gardens” was distributed to the local population.
- A “spring cleaning” was organised to eliminate potential sites in gardens (recipients, old tires, etc.). A letter from the town council was distributed to all residents of Natoye and the town organised a day for free waste collection (29 April 2013) to raise awareness among the population.
- A personalised letter was sent to the land owners selected for inspections.
- Two public meetings were organised, the first on 27 March 2013 by Avia-GIS, the second on 3 April 2014 by the SPW for the residents of Natoye and Ciney.
- All the above activities were covered by the local and regional press.

Outlook

- A new project (MEMO) was launched in 2017 to limit the introduction of alien mosquitoes in Belgium. This research project is funded by numerous public authorities in Belgium, namely the Flemish, Wallonian and Brussels administrations, the Federal public service (SPF) and the Public health and Food and environmental safety services. A cooperation agreement was signed to organise the collaborative effort in the fields of public health and the environment (NEHAP) over a three-year period. The Institute for tropical medicine in Antwerp is in charge of monitoring a network of potential introduction sites of alien mosquitoes in Belgium, including the Natoye site.

Regulations

- No specific regulations currently exist concerning the Asian bush mosquito in Belgium or France.

Authors: Dr. Veerle Versteirt and Dr. Guy Hendrickx, Avia-GIS, Céline Prévot and Etienne Branquart, Wallonian interdepartmental group against invasive species (CiEi), and Doriane Blottière, IUCN French committee. January 2018.

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7, 8. The brochure titled “Mosquitoes - Simple measures to avoid their proliferation in our gardens” .
9. A screen shot of the home page of the web site on the Asian bush mosquito.

For more information

- Internet site on the Asian bush mosquito: http://biodiversite.wallonie.be/moustique japonais
- "Les Moustiques, des gestes simples pour éviter leur prolifération dans nos jardins". Cellule interdépartementale espèces invasives. Service public de Wallonie. 2 pp.

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2018 edition

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