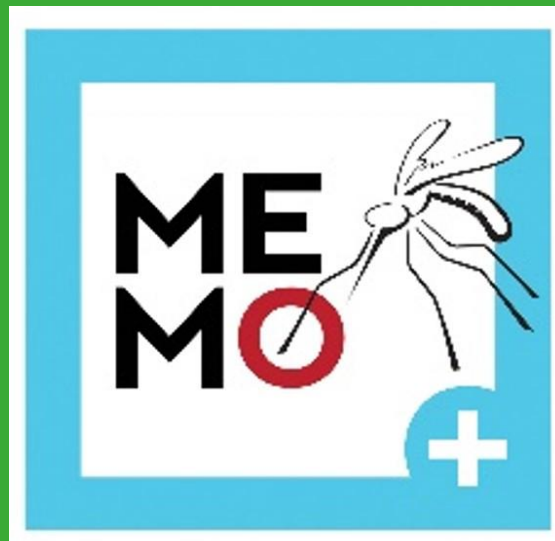


MEMO+ PROJECT ANNUAL REPORT 2023

**Monitoring of Exotic MOsquitoes in Belgium
Results of the surveillance of the mosquito season
2023**



Sciensano

Epidemiology and public health • Epidemiology of infectious diseases • Vector-borne and zoonotic diseases

Institute of Tropical Medicine Antwerp

Entomology Unit

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SUMMARY

The monitoring of exotic mosquitoes in Belgium is the main task of the MEMO+ project. The project exists of two complementary parts: passive surveillance, where citizens can report through pictures a tiger mosquito via a website or an app; and active surveillance at known Points of Entry (PoEs), in this case parking lots along highways.

In 2023 the number of notifications through the passive surveillance doubled compared to 2022, with a total of 661 reports made via the platform. Among these, we received 27 pictures of *Aedes albopictus* mosquitoes coming from 18 locations in urban areas in Belgium, which is a doubling compared to 2022. Three locations were known from last year (Lebbeke, Wilrijk and Wondelgem), and the other 15 were new locations: 12 in Flanders, two in the Walloon region, and one in Brussels capital region. In total, 11 field visits were performed to assess the situation of *Ae. albopictus*. At several of these locations people experienced biting nuisance in their gardens. In Wilrijk and Lebbeke, a longitudinal surveillance was implemented which resulted in the confirmation of the overwintering of *Ae. albopictus* in both locations and indications that, at least in Wilrijk, the population is spreading. The active surveillance performed at eight parking lots confirmed the continuing introductions of the tiger mosquito by road traffic into our country as eggs of *Ae. albopictus* (and in one *Ae. japonicus*) were detected at seven out of the eight parking lots.

We can expect that the number of new locations with *Ae. albopictus* will continue to increase over the coming years.

In this report, we present the results of the surveillance of *Ae. albopictus* in Belgium in 2023.

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1. Introduction

Aedes albopictus is an important vector of arboviruses such as dengue virus, chikungunya virus and Zika virus (further referred to as *Aedes*-borne viruses (ABV)). Over the past two decades, the species has expanded its range, spreading northward in Europe. In our neighbouring countries, it is currently established in France and in Germany, and has been reported every year in the Netherlands. In some of the European countries where it is established, *Ae. albopictus* has been responsible for local transmission of ABV. Therefore, the surveillance of *Ae. albopictus* is of paramount importance to prevent or delay their introduction and establishment.

In order to prevent human cases of *Aedes*-borne diseases (ABD) due to autochthonous transmission in Belgium, a number of elements need to be in place including a good surveillance of this species, a good surveillance of ABD in humans and an integrated analysis to timely cross and interpret the information coming from both sources. The integration of the different surveillance data is pivotal to successfully prevent and respond to local transmission of ABD.

In this context, the MEMO+ project aims to ensure the surveillance of *Ae. albopictus* in Belgium based on knowledge gained within previous projects. It is based on two complementary approaches:

- **Passive surveillance:** which relies on citizen science, in which citizens contribute to the surveillance by notifying the presence of *Ae. albopictus* through pictures
- **Active surveillance:** which consisted in 2023 of three activities:
 - the inspection after a notification through passive surveillance (IPM).
 - the longitudinal surveillance at eight points of entry (PoE's);
 - the longitudinal surveillance of two potential overwintering sites;

This combination of active and passive surveillance allows the early detection of introductions of *Ae. albopictus* in Belgium and to assess the presence of *Ae. albopictus* beyond the PoE's by covering a broader part of the Belgian territory through the passive surveillance system.

The project is coordinated by Sciensano in collaboration with the Institute of Tropical Medicine, Antwerp. Sciensano coordinates the overall project and it is also responsible for the coordination of the passive surveillance (citizen science), while the Institute of Tropical Medicine coordinates and carries out the active surveillance.

In this report we present the results of the second year of the MEMO+ project (January- December 2023): the results of the passive surveillance, the results of the surveillance at parking lots (PoEs) and at potential overwintering locations, as well as the findings after field inspections following a positive notification.

2. Results of the surveillance

2.1. PASSIVE SURVEILLANCE

The passive surveillance of exotic mosquitoes relies on citizen science. By this mean, citizens are invited to report the presence of *Ae. albopictus* mosquitoes via the platform MuggenSurveillance/SurveillanceMoustiques (website or App) in which pictures of suspected tiger mosquitoes can be uploaded. Surveillance relies then on morphological identification of photographed mosquitoes to determine the species.

In other European countries where this type of citizen surveillance has been implemented, citizen involvement has shown to provide important information for the surveillance of *Ae. albopictus*¹. It has become the main tool for detecting the species at sites far from colonised areas². The tool also allows the surveillance in areas where active surveillance would not be possible such as on private land or difficult-to-access sites. Moreover, citizen science can also be used as a means of raising public awareness and can serve as the first step of community involvement in preventing/eliminating mosquito breeding sites.

2.1.1. Morphological Identification and validation

The mosquitoes on the pictures uploaded by citizens are morphologically identified to confirm whether it is a tiger mosquito or not. After submission of a picture through the online platform, an automatic email is sent to the notifier including some extra information and to acknowledge receipt. Pictures are analysed on a regular basis by Sciensano, with confirmation by ITM. Based on the identification, the status of the pictures is set as negative if it is not an *Ae. albopictus* mosquito, positive in case it is an *Ae. albopictus* mosquito, or doubtful in case we cannot conclude whether it is an *Ae. albopictus* mosquito or not. Afterwards, the notifier receives an email with the result of the identification and the result of the picture appears on the website.

Depending on the result of the identification, three possible scenarios may arise with the following action:

- a. **Negative:** Sciensano provides feedback to the notifier and no further action is taken.
- b. **Doubtful:** Sciensano contacts the notifier and asks for more information about the finding and requests clearer photo(s) (if possible).
- c. **Positive:** Sciensano contacts the notifier to confirm the location and to collect more information such as in which environment the specimen was found and also the context in which it was found. A field team is deployed to make an inspection on site, also called 'Inspection after positive notification though Passive Monitoring' (IPM) to verify the presence of the mosquito and assess the size and spread of the population.

¹ Kampen H, Medlock JM, Vaux AGC, Koenraadt CJM, van Vliet AJH, Bartumeus F, Oltra A, Sousa CA, Chouin S, Werner D. 2015. Approaches to passive mosquito surveillance in the EU. *Parasites & Vectors*. 8:9.

² Eritja R, Ruiz-Arrondo I, Delacour-Estrella S et al. First detection of *Aedes japonicus* in Spain: an unexpected finding triggered by citizen science. *Parasites & Vectors* 12, 53 (2019).

2.1.2. Results of Citizens notifications

In 2023, 661 notifications were made by citizens referring to observations in Belgium via the platform MuggenSurveillance/SurveillanceMoustiques. Another 18 notifications were observations from other countries (Spain, Italy, France, the Netherlands). Of the 661 notifications, 418 (63.2%) were made in Flanders, 192 (29.0%) in Wallonia and 51 (7.7%) notifications were made in Brussels. Six hundred and five notifications were of an insect, and of these 486 (80.3%) were identified as a mosquito (Culicidae) (**Table 1**). Among the Culicidae, we were able to identify following genera: *Aedes* spp., *Culiseta* spp. and *Culex* spp. (**Table 1**).

Aside of the notifications via the platform, we received another 143 notifications via email of which 100 notifications were a picture of an insect. Of these 100 notifications, 48 pictures were of mosquitoes (Culicidae) (**Table 1**). Further results below reflect only the results of the notifications that were made through the MuggenSurveillance/SurveillanceMoustique platform.

Table 1 Mosquito species (Culicidae) notified in 2023 via the platform and via email.

Mosquito genus	Platform	Email
Genus <i>Aedes</i>	223	18
Genus <i>Anopheles</i>	1	0
Genus <i>Culex</i>	2	0
Genus <i>Culiseta</i>	220	16
No genus defined (Culicidae)	40	14
TOTAL	486	48

In total, in 2023, 27 *Ae. albopictus* (tiger mosquitoes) were notified via MuggenSurveillance.be/SurveillanceMoustiques.be in Belgium (5.6% of all mosquito pictures that were uploaded) from 18 different locations. Out of the 18 locations, 15 were new locations compared to 2022. The first notifications of the season were made in July in Wilrijk (WI1) and Lebbeke (LE1). From mid-August onwards, tiger mosquitoes were notified in the following locations: Evergem (EG1), Kessel-Lo (KL1), Drongen (DR1), Puurs-Sint-Amands (PS1), Gijzenzele (GZ1), and Ath (AA1). In September, notifications of tiger mosquitoes were made in Kapelle-op-den-Bos (KB1), Roosdaal (RD1), Melle (ME1), Wolfsdonk (WD1), Ath (AA1 & AA2), Oudenaarde (OU1), Wondelgem (WO1), Leuven (LV1), Schaarbeek (SB1), Herstal (HS1) and Schelle (SC1) (**Figure 1**).

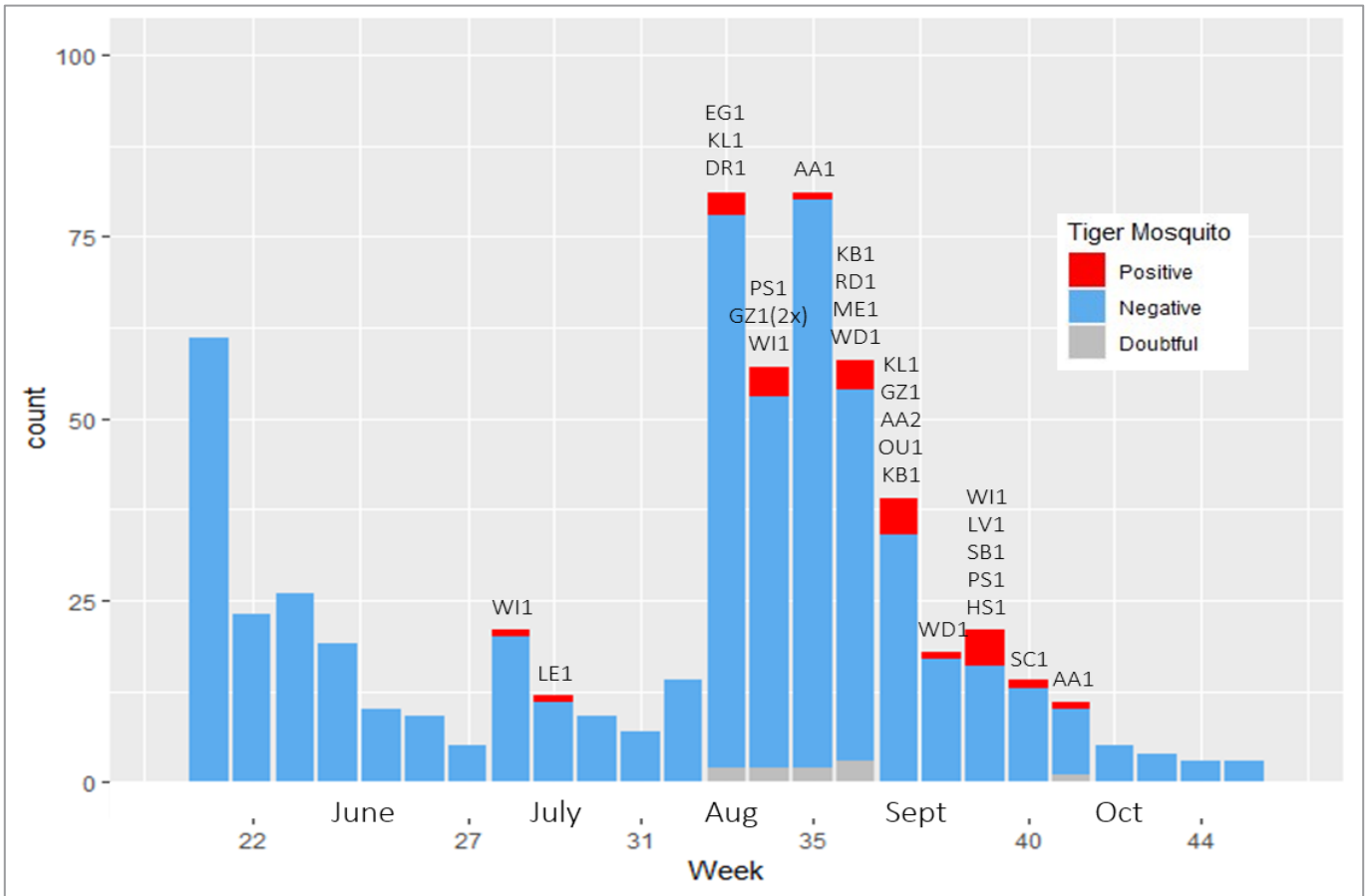


Figure 1 Number of notifications per status per week (21-45) in 2023 made via the platform. AA1=Ath, AA2=Ath, DR1=Drongen, EG1=Evergem, GZ1=Gijzenzele (Oosterzele), HS1=Herstal, KB1=Kapelle-op-den-Bos, KL1=Kessel-Lo (Leuven), LE1=Lebbeke, LV1=Leuven, ME1 =Melle, OU1=Oudenaarde, PS1=Puurs-Sint-Amands, RD1=Roosdaal, SB=Schaarbeek, SC1=Schelle WD1=Wolfsdonk (Aarschot), WI1=Wilrijk (Antwerp), WO1=Wondelgem.

The distribution of notified tiger mosquitoes per province and the number of locations with a tiger mosquito can be found in **Table 2**. More information about the specific locations can be found on **Figure 22**.

Table 2 Overview of the number of tiger mosquito pictures and positive locations per province.

Province	Number of tiger mosquito pictures	Positive Locations
Antwerpen	6	2
Vlaams-Brabant	7	5
Oost-Vlaanderen	9	8
Brussels	1	1
Hainaut	3	1
Liège	1	1

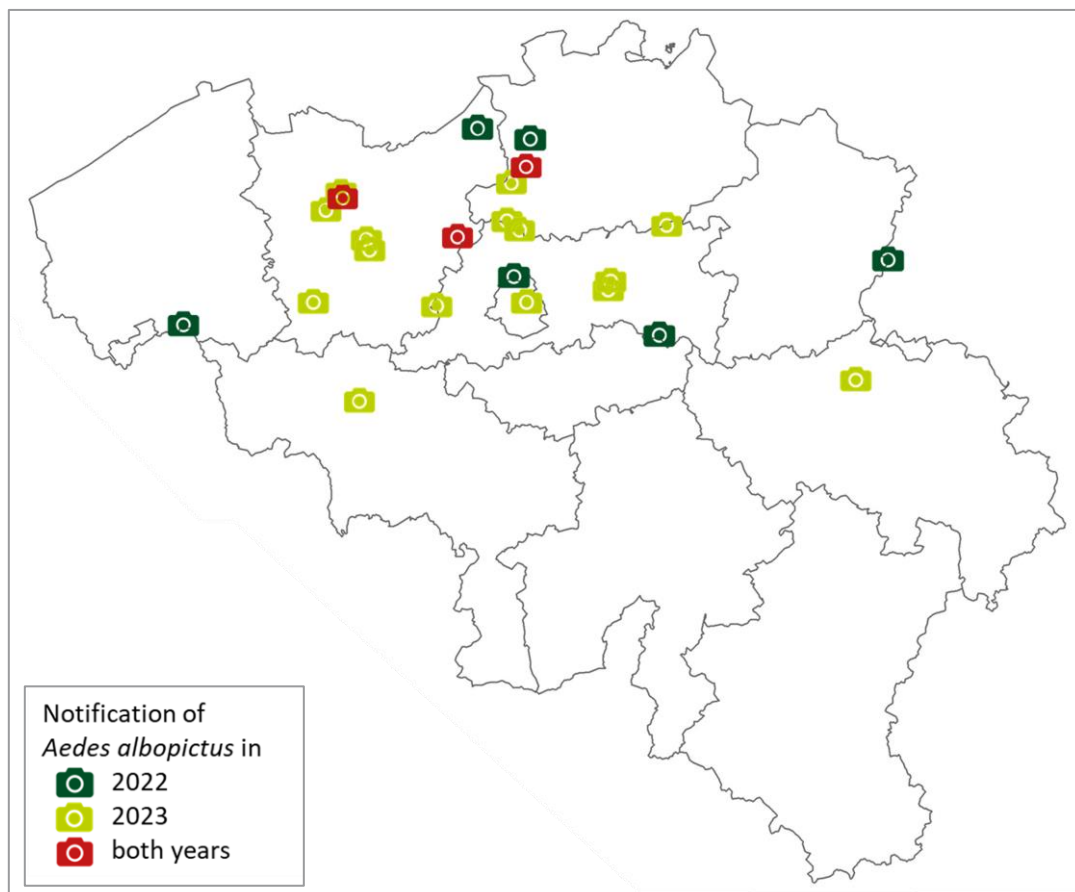


Figure 2 Locations of tiger mosquito notifications reported by citizens through MuggenSurveillance/SurveillanceMoustiques in Belgium in 2022 and 2023.

2.2. ACTIVE SURVEILLANCE

The active surveillance, carried out in the field, consisted in 2023 of three activities (**Figure 33**):

- Field inspection after a positive notification through passive monitoring (IPM);
- The longitudinal surveillance at eight points of entry (PoE's), i.e. parking lots;
- The longitudinal surveillance of two potential overwintering sites, i.e. Wilrijk and Lebbeke.

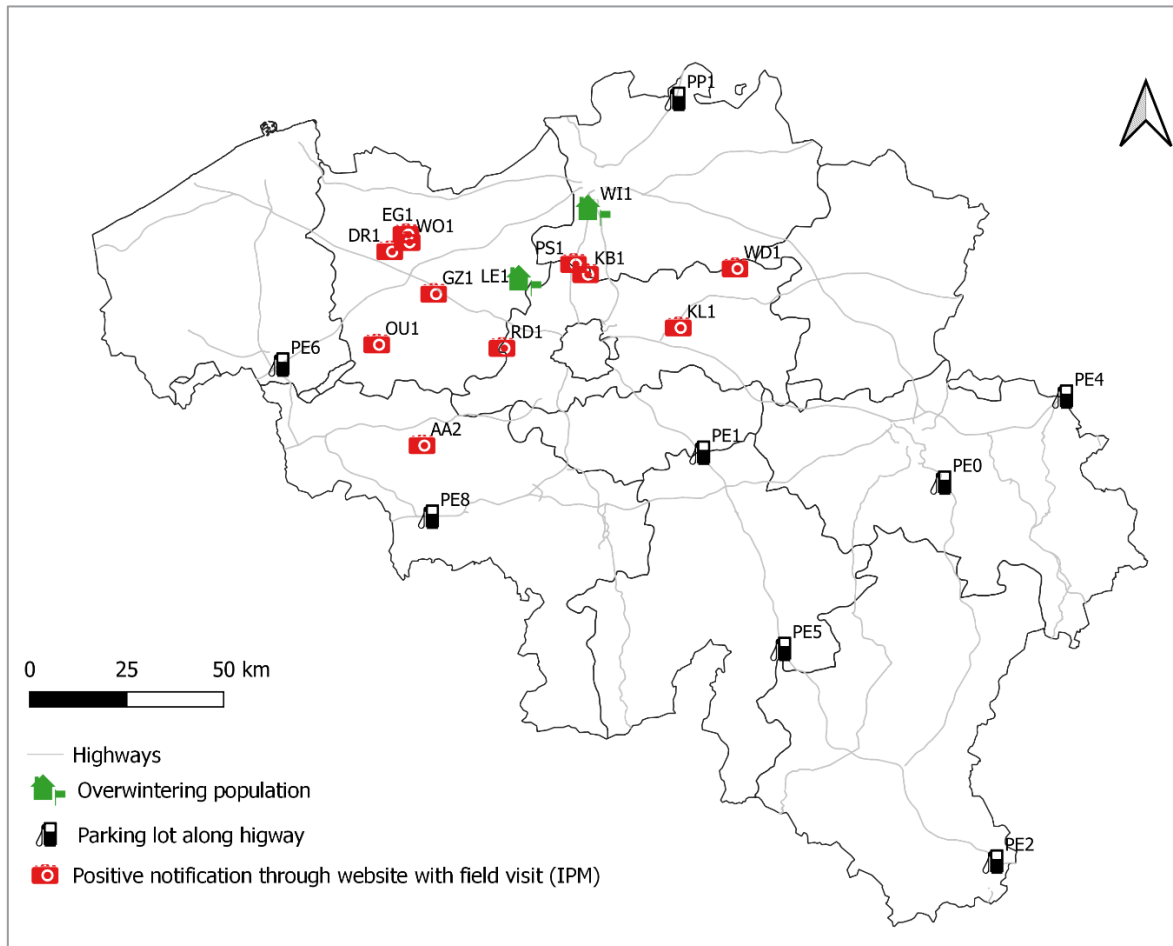


Figure 3 Overview of all locations in Belgium where active surveillance was performed in 2023.

AA2=Ath, DR1=Drongen, EG1=Evergem, GZ1=Gijzenzele (Oosterzele), KB1=Kapelle-op-den-Bos, KL1=Kessel-Lo (Leuven), LE1=Lebbeke, OU1=Oudenaarde, PE0=Parking lot Sprimont/Noidré, PE1=Parking lot Aische-en-Retail, PE2=Parking lot Hondelange, PE4=Parking lot Raeren, PE5=Parking lot Wanlin, PE6=Parking lot Marke, PE8=Parking lot Saint-Ghislain, PS1=Puurs-Sint-Amands, PP1=Parking lot Minderhout, RD1=Roosdaal, WD1=Wolfsdonk (Aarschot), WI1=Wilrijk (Antwerp), WO1=Wondelgem.

2.2.1. Inspections after positive notification through passive Monitoring (IPM)

In total, through the citizen platform, 27 pictures of tiger mosquito from 18 different locations were uploaded by citizens. Of these 18 locations, 11 were visited for an IPM (**Figure 4**). These locations included: Ath (AA2), Drongen (DR1), Evergem (EG1), Gijzenzele (Oosterzele) (GZ1), Kapelle-op-den-Bos (KB1), Kessel-Lo (Leuven) (KL1), Oudenaarde (OU1), Puurs-Sint-Amands (PS1), Roosdaal (RD1), Wolfsdonk (Aarschot) (WD1), Wondelgem (WO1).

An IPM visit consisted of a field inspection in the 100 m perimeter around the house of the positive notification. The IPM was done in two days:

- On **day 1**, a team of two people set-up ten oviposition traps in the centre and close to the border of the 100 m perimeter and performed door-to-door larval sampling in the perimeter.
- On **day 14**, a team of two people performed door-to-door larval sampling in the perimeter, and removed the 10 oviposition traps.

At five locations (Melle (ME1), Schaarbeek (SB1), Schelle (SC1), Leuven (LV1), Herstal (Liège) (HS1)) no IPM was carried out because of several reasons among which an already full IPM planning (ME1, LV1) and end of season (SC1, HS1). In Schaarbeek (SB1), although no IPM could be performed, a short larval inspection at and around the location of the notification was done together with a training of the pest control operator (PCO).

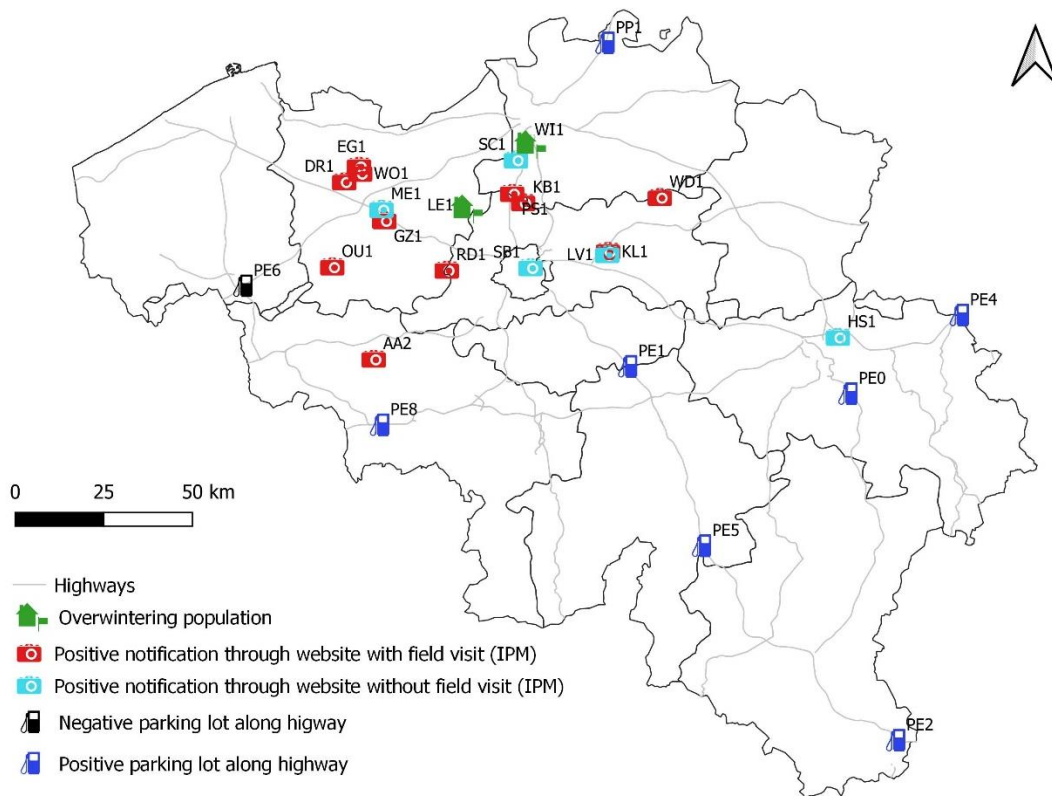


Figure 4 Overview of the 16 positive notifications in Belgium with indication if an IPM was done or not and, of the eight monitored parking lots along highways in Belgium in 2023 with indication of the positive parking lots for *Ae. albopictus* and of the overwintering populations in Wilrijk and Lebbeke. (Abbreviations see **Figure 3**).

At nine of the 11 locations, larvae, eggs and/or adults were collected during the IPM. At Kessel-Lo, Roosdaal and Ath, female and male *Ae. albopictus* were collected by hand during the IPM. At seven locations (Ath, Drongen, Gijzenzele, Kapelle-op-den-Bos, Kessel-Lo, Puurs-Sint-Amands, Roosdaal) *Ae. albopictus* adults, larvae and/or eggs were collected at less than 20 m from the border of the 100 m perimeter. This indicates that *Ae. albopictus* might already be spread outside the 100 m perimeter at these locations or the epicenter of the infestation is not at the location of the notifier.

No *Ae. albopictus* specimens were collected during the IPM at Evergem and Wondelgem. In both locations the garden of the notifier and other gardens in the 100 m perimeter were cleaned up, which could explain the absence of tiger mosquito collections during the IPM. It will be important to be vigilant next season and to inform the citizens about the tiger mosquito and strengthen the passive surveillance in that area.

At six of the 11 locations where an IPM took place, a control campaign was started (KL1 (2 treatments), DR1 (2 treatments), GZ1 (2 treatments), KB1 (2 treatments), RD1 (1 treatment), PS1 (1 treatment)) (**Table**).

Table 3 The 27 notifications of *Ae. albopictus* through passive surveillance at potential overwintering and new locations, detections during subsequent field inspections (IPM) or during longitudinal surveillance (LOS), and implemented control measures in 2023.

Location	Location name	Monitoring		Apr		May				Jun				Jul				Aug				Sep				Oct				Nov							
		Type	Perimeter	w16	w17	w18	w19	w20	w21	w22	w23	w24	w25	w26	w27	w28	w29	w30	w31	w32	w33	w34	w35	w36	w37	w38	w39	w40	w41	w42	w43	w44	w45	w46	w47	w48	
WI1	Wilrijk	LOS	500 m																																		
LE1	Lebbeke	LOS	500 m																																		
KL1	Kessel-Lo	IPM	100 m																																		
EG1	Evergem	IPM	100 m																																		
DR1	Drongen	IPM	100 m																																		
GZ1	Gijzenzele	IPM	100 m																																		
KB1	Kapelle-op-den-Bos	IPM	100 m																																		
RD1	Roosdaal	IPM	100 m																																		
PS1	Puurs-Sint-Amands	IPM	100 m																																		
WD1	Wolfsdonk	IPM	100 m																																		
AA2	Ath	IPM	100 m																																		
OU1	Oudenaarde	IPM	100 m																																		
WO1	Wondelgem	IPM	100 m																																		
SB1	Schaarbeek	INS	100 m																																		
LV1	Leuven	-	-																																		
ME1	Melle	-	-																																		
HS1	Herstal	-	-																																		
SC1	Schelle	-	-																																		

LOS = longitudinal surveillance of potential established areas, IPM = inspection after a positive notification via passive monitoring, INS = short inspection and training of pest control operator at and around notification, = notification of *Ae. albopictus* through picture on website, = sampling period without collections of *Ae. albopictus*, = *Ae. albopictus* specimens collected, = control measures implemented.

2.2.2. Longitudinal surveillance of potentially overwintering populations in Lebbeke (LE1) and Wilrijk (WI1)

Based on the findings in Lebbeke and Wilrijk in 2022 (**Figure 4**), a longitudinal monitoring was set-up from April to October 2023. The following actions were taken:

- Larval sampling in the 200 m buffer zone at the start, middle and end of the mosquito season.
- Trapping with 20 oviposition traps in the 500 m buffer zone (same locations as in 2022). Every two weeks between the beginning of May and the middle of October 2023 the traps were sampled in collaboration with staff from the technical service from the municipalities (voluntary basis). They were trained at the beginning of May 2023.

Lebbeke (LE1)

The first larval sampling in 2023 took place on 24 April 2023. This larval inspection focused on the houses in the 200 m buffer zone and one house just outside the 200m zone where *Ae. albopictus* was found in 2022. The second larval inspection took place on 22 August 2023 and focused on the houses outside the 200 m buffer zone, but within the 500 m buffer zone. The third and final larval inspection, on 17 October 2023, focused on the southern part of the 500 m buffer zone as one of the oviposition traps in this area was positive in September 2023.

The three larval inspections in Lebbeke were all negative. The cold weather could partly explain the negative result during the first larval inspection in April. On 18 July 2023 a positive notification was received through the website from the same location as in 2022. Moreover, between 18 July and 1 August, 22 eggs of *Ae. albopictus* were collected in two oviposition traps in the 200 m buffer zone, close to the notification. This detection of adults and eggs very close to the same location as in 2022 and relatively early in the season indicates possible overwintering. Another oviposition trap was positive between 29 August and 12 September (19 eggs) and was located close to the southern border of the 500 m buffer zone. This may indicate the spread of *Ae. albopictus* in Lebbeke, although this has not been proven. There is also still the possibility that these are eggs from a new introduction. In conclusion, *Ae. albopictus* is still present in Lebbeke, despite the preventive control actions (5 treatments in 2023) (**Table** Table 3)

Wilrijk (WI1)

Larval sampling in 2023 was carried out on 27 April 2023, this larval inspection focused on the houses in the 200 m buffer zone where *Ae. albopictus* was found in 2022. The larval inspection on 17 August 2023 focused on the houses in the northwest in the 500 m buffer zone. The final larval inspection on 19 October 2023 focused on the south-eastern part of the 500 m buffer zone as one of the oviposition traps in this area was positive in August 2023.

Larvae of *Ae. albopictus* were not collected during the first larval sampling in April, but they were found during the other two larval samplings in August and October. The cold weather could explain partly the negative result during the first larval inspection in April. On 13 July 2023 a positive notification was received through the website from a location of which the garden is bordering the first positive location from 2022. In this same period (7 July until 20 July) 54 eggs of *Ae. albopictus* were collected from two oviposition traps in the 200 m buffer zone. This detection of adults and eggs very close to the same location as in 2022 and relatively early in the season indicates most probably overwintering. One of these two positive traps and another trap were also positive in September (nine eggs in total). During the second larval sampling on 17 August 2023, 23 larvae and one pupa

were collected in rainwater barrels in the allotment garden at the southern border of the 200 m buffer zone. Also, during the half-day training of the Pest Control company on 31 August 2023, seven larvae were collected in this allotment garden. Another oviposition trap located at the southern border of the 500 m buffer zone, was positive between 18 August and 4 September (one egg). Therefore, the final larval inspection on 19 October 2023 was performed in this southern area, resulting in one positive garden where three larvae and one adult male were collected. These results may indicate the spread of *Ae. albopictus* in Wilrijk, although this has not been proven. There is also still the possibility that these are specimens from a new introduction. To conclude, *Ae. albopictus* is still present in Wilrijk, despite the preventive control actions (5 treatments in 2023) (**Table 3**).

2.2.3. Longitudinal Surveillance at parking lots

Between April and October 2023 ten oviposition traps were set-up and sampled every four weeks at eight parking lots along a highway. This was done in collaboration with local partners such as, for example, the directorate of roads in Wallonia or the Agency for Road and Traffic in Flanders.

During the summer of 2023, 327 eggs of *Ae. albopictus* were collected at seven parking lots: Sprimont (PE0), Aische-en-Refail (PE1), Hondelange (PE2), Raeren (PE4), Wanlin (PE5), Saint-Ghislain (PE8) and Minderhout (PP1) (**Figure 4**). At the parking lot Hondelange (PE2) also 57 eggs of *Ae. japonicus* were collected in August 2023. **Table 4** gives an overview of the eight monitored parking lots with indication of the detection of *Ae. albopictus* in previous years (since the start of the MEMO project in 2017) and in 2023.

Table 4 Overview of the eight surveyed parking lots between 2017 and 2023 with indication of the local partner, the number of years it was monitored and the detection of *Ae. albopictus* in previous years (grey=implemented active surveillance but no detection of *Ae. albopictus*; red=detection of *Ae. albopictus* during surveillance).

Parking lot	Location	Highway	Local partner	# of years monitored (>2 months)	2017	2018	2019	2020	2021	2022	2023
PE0	Sprimont	E25	DGO1	3							
PE1	Aische-en-Refail	E411	DGO1	4							
PE2	Hondelange	E25	DGO1	6							
PE4	Raeren	E40	DGO1	6							
PE5	Wanlin	E411	DGO1	4							
PE6	Marke	E17	VMM	5							
PE8	Saint-Ghislain	E19	DGO1	5							
PP1	Minderhout	E19	AWV	3							

*Local partners: DGO1=directorate of roads (Wallonia), VMM=Flemish Environment Agency, AWV=Agency for Road and Traffic (Flanders)

Twenty twenty-three is the first year that eggs of *Ae. albopictus* were collected at Raeren (PE4) and Saint-Ghislain (PE8). At three parking lots (Wanlin (PE5), Hondelange (PE2) and Aische-en-Refail (PE1)) eggs were collected during two consecutive sampling periods in one or two of the ten oviposition traps. At the other parking lots one oviposition trap was positive on one occasion. The mean number of eggs per ovitrap was low at all parking lots (range: n = 0 – 5.8) compared to colonised sites in neighbouring countries³.

In general, these findings reflect new introductions from female mosquitoes traveling from colonised areas in neighbouring countries. The detection of *Ae. albopictus* at these parking lots comes as no surprise, as they are located along major highways linking regions of France and Germany where the species is established. These parking lots are important resting places for tourists and truck drivers. The many detections show that *Ae. albopictus*, but also *Ae. japonicus*, is increasingly being introduced by road traffic. It will be important to continue (PE0, PE2, PE5) or start (PE1, PE4, PE8, PP1) to take preventive measures at these parking lots the next years including sensitization, treatment of the catch basins and removal of waste.

³ Lacour, G., Chanaud, L., L'Ambert, G., Hance, T. (2015). Seasonal synchronization of diapause phases in *Aedes albopictus* (Diptera: Culicidae). PLoSONE10(12):e0145311. doi:10.1371/journal.pone.0145311.

3. Discussion

In 2023, the second year of implementation of passive surveillance through citizen-science, more than 600 notifications of potential tiger mosquitoes were made via the platform by citizens in Belgium. Among these, 27 were tiger mosquitoes coming from 18 unique locations. This means that the number of locations where tiger mosquitoes were detected doubled compared to 2022. We received tiger mosquito notifications from 15 new locations and from three locations that were the same as in 2022. Out of these 15 locations, 11 field inspections after a positive notification through passive surveillance (IPM) were performed. Larvae, eggs and/or adults were collected at nine of these 11 locations. On top of that, tiger mosquitoes were detected through active surveillance at seven out of the eight parking lots on the highway. This is also twice as much as in 2022.

These results indicate that there is an increasing import of tiger mosquitoes by road traffic, not only leading to expected detections at parking lots, but also leading to an increased number of findings in residential areas. In some of the new locations of 2023, the findings in the field were limited to one garden or to two connected gardens. In other cases, more gardens were infested, and the density of tiger mosquitoes was of this order that at several moments, tiger mosquitoes were found to enter the car. During the 2023 season, a notification of a tiger mosquito was made for the first time by both a citizen from Brussels (one location) and a citizen from Wallonia (two locations). Belgium is clearly at the invasion front of the tiger mosquito, and it is expected that the number of findings will only increase in the coming years.

The import pathway at most locations where tiger mosquito was found is unknown. It is not *per se* the notifier that imported the tiger mosquito. At some locations potential import pathways could be identified. In Gijzenzele and Roosdaal the import of the tiger mosquito could be linked to the movement of plants and pots from France to Belgium. The premises in Kessel-Lo where tiger mosquitoes were found, are situated in an industrial area, while those in Puurs-Sint-Amands were close to a large brewery and the highway. At both locations there is a lot of freight traffic, which might be the possible import pathway but other pathways such as import via travellers by car from the south of Europe cannot be excluded. Therefore, it will be important to sensitize travellers (including people moving from a colonised area to Belgium) and truck drivers about the risk of importation of tiger mosquitoes.

This second year with IPMs in private gardens confirmed that the collaboration with the municipalities for communication with their inhabitants before the field visits is crucial. It informs and prepares the inhabitants for the visit of the field team, increasing the chances that people are willing to give the field team access to their houses and gardens and reducing the time needed for explanation.

In two locations where the tiger mosquito was observed in 2022, Lebbeke and Wilrijk, overwintering was assessed at the very beginning of the mosquito season and a longitudinal monitoring was set-up to follow the presence and spread throughout the season. Due to unpredictable changes in the weather, larvae were not found at the first larval samplings performed on 24 and 27 April 2023. However, in mid-July adult tiger mosquitoes were detected by citizens from Lebbeke and Wilrijk, and eggs were found in the oviposition traps in both places. This finding supports our conclusion that the tiger mosquito overwintered in Lebbeke and Wilrijk. During the season, more specimens were collected at both locations, indicating that the tiger mosquito is still present despite control measures. In Wilrijk, tiger mosquitoes were detected in several places within the 200 m and at different time points at the border of the 500 m buffer zone. This could implicate that the tiger mosquito is spreading in Wilrijk, although new introductions can not be completely excluded. In Lebbeke, the detections of the tiger mosquito were limited to the 200 m zone except for one positive oviposition trap at the border of the 500 m zone. At this point we cannot confirm whether this is a new introduction or whether the tiger mosquito is actually spreading in Lebbeke.

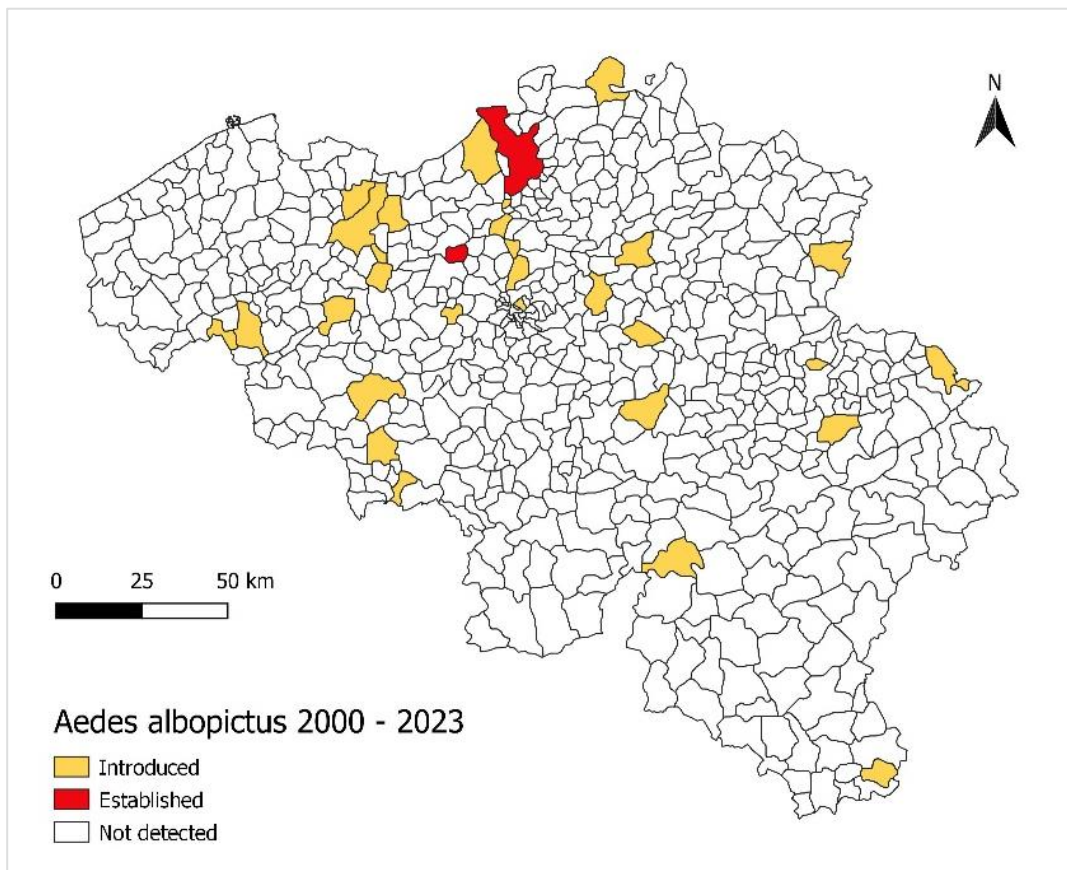


Figure 1 Map with the establishment and introduction of *Aedes albopictus* by municipality in Belgium, 2000 – 2023

4. Conclusion

In 2023 the increase in locations where the tiger mosquito has been detected together with the findings of overwintering populations in at least two places in Belgium is worrisome. Even though the increase in the number of locations was somehow expected, the situation is evolving rapidly.

Based on the current situation in which Belgium is at the invasion front of the tiger mosquito, the number of introductions of *Ae. albopictus* in Belgium is expected to increase in the coming years with more locations experiencing important nuisance during the summer months. Also, the situation in Lebbeke and Wilrijk needs further follow-up. Now that overwintering has been confirmed, the spreading needs to be closely monitored as an increase in these mosquito populations will increase the risk of local transmission of viruses such as dengue, chikungunya or Zika. Controlling the known populations of the tiger mosquito seems still feasible. Control of these populations will be essential in order to prevent spreading and keep the tiger mosquito populations as limited as possible. Moreover, preventive control at the parking lots is also needed to decrease the impact of continuous introductions.

The current surveillance of exotic *Aedes* mosquitoes in Belgium is a first and important step to understand the current trend of the invasion of the tiger mosquito. Yet, there is a real need for a “National Action plan for the prevention, monitoring and control of *Aedes albopictus* and the prevention of *Aedes*-borne diseases” with a strong cooperation across policy areas and across regions. This plan should include several aspects such as sustainable surveillance of the vector, an exhaustive and timely human diseases surveillance, an efficient vector control strategy based on a good communication/sensitisation strategy and a strong governance.

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