Scuola universitaria professionale della Svizzera italiana
Dipartimento ambiente costruzioni e design
Istituto microbiologia

SUPSI

Intermediate Report

Reference no.:	**BAG-D-FCFF3401/390**
Reporting Period:	**08 July 2025 – 31 October 2025**
Project title:	**Assessment of smart trap technology for monitoring arbovirus vector mosquitoes (*Aedes albopictus* and *Culex pipiens*) in the Swiss urban surveillance system: evaluation conducted in the canton of Geneva during the 2025 summer season**
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1. Background and scope of the study

The urban-dwelling invasive mosquito species *Aedes albopictus*, commonly known as the tiger mosquito, is spreading increasingly across Switzerland—driven in part by climate change—and poses a growing public health concern due to its ability to transmit dangerous pathogens such as dengue, chikungunya, and Zika viruses. First detected in the Canton of Ticino in 2003, this species has since appeared north of the Alps, reaching most cantons, with established populations particularly in the cantons of Geneva and Basel-City. Its proliferation not only heightens the risk of disease transmission but also causes significant nuisance in densely populated areas.

The native mosquito species *Culex pipiens*, which can thrive in both urban and natural environments, represents an additional public health concern due to its role as a vector of West Nile virus (WNV).

For effective control, it is important to know when and where these organisms occur, spread, and behave. Monitoring is therefore essential for any potential control measures and thus for reducing the risk of disease. Currently, the most effective method for large-scale surveillance of *Ae. albopictus* is the use of ovitraps, a low-cost approach in terms of materials, though labor-intensive to manage and analyse. Adult mosquito traps offer and alternative means of detecting this species, but they are expensive and require significant operational effort, restricting their use to selected areas. Consequently, many cantons struggle to maintain robust monitoring systems.

The Spanish company Irideon SL. (Barcelona, Spain; www.irideon.es), following an experimental development phase, is preparing to distribute a “Smart Trap Technology” intended to enable automated and digitally controlled monitoring of *Aedes albopictus*. The novel system VECTRACK, based on a specific optical sensor mounted on a commercial adult trap and combined with a supervised machine learning algorithm, enables automated counting and determination of *Aedes* and *Culex* mosquitoes by genus and sex. The system provides real-time data directly to the user’s computer interface. A key advantage of this trap is that it requires no manual intervention beyond the initial deployment.

Two previous trials showed that VECTRACK can provide good approximations of the real adult counts (Gonzalez-Perez et al. 2024; Micocci et al. 2024). Therefore, the present study aims at estimating the precision of this tool in Switzerland in real field conditions and its practical applicability for early detection and control of the tiger mosquito. The results of the study will serve as the basis for evaluating a larger use of these traps in Switzerland to monitor adult abundances.

This interim report describes the trap setup and the procedures for data collection and recording. It will be followed by a presentation of the results to the BAG at the meeting of the Working Group (WG) on “Vectors” of the Subsidiary Body “One Health”, to be held on 3 Decembre 2025 in Mendrisio, and by the detailed final report, due by February 2026 at the latest.

2. Status of the study

The Canton of Geneva was chosen as study location because the tiger mosquito is spreading rapidly (Figure 1), but no direct surveillance system has yet been set up in this canton, while control measures are already in place through the regular application of larvicides in public areas.

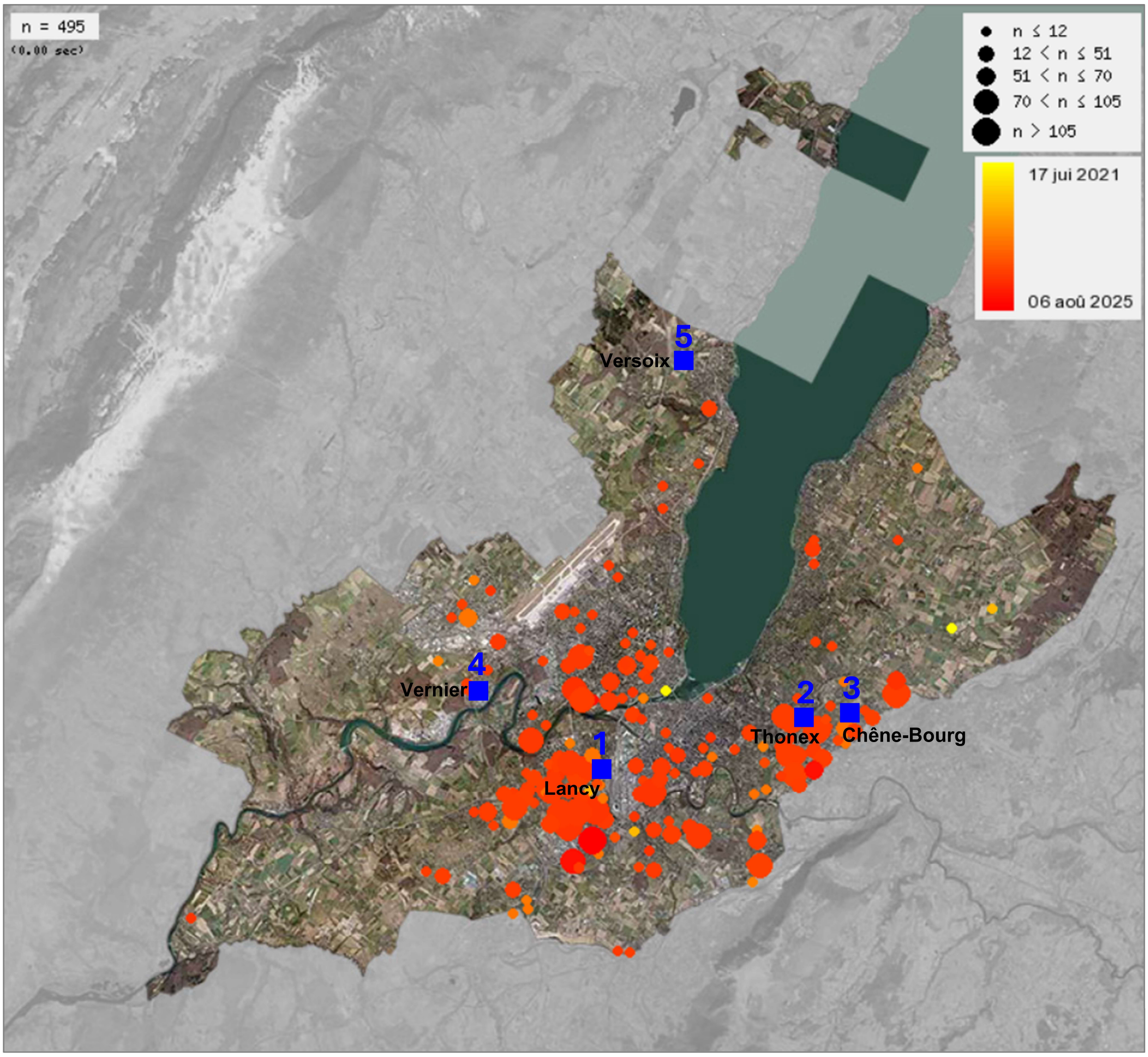


Figure 1. Locations of reported tiger mosquitoes (round dots) in the Canton of Geneva between 2021 and 2025 (image source: Faune Genève, https://www.faunegeneve.ch/index.php?m_id=30038), and the five sites (blue squares) selected for smart trap deployment in summer 2025.

The experimental design was developed by Zurich Data Scientists (ZDS) under supervision of the Vector Ecology Unit (ECOVET), at the Institute of Microbiology, University of Applied Sciences and Arts of Southern Switzerland (SUPSI), and the Cantonal Office for Agriculture and Nature (OCAN), Department of Territory, Canton Geneva.

According to the manufacturer of VECTRACK, a minimum of five smart traps is required to implement surveillance in the Canton of Geneva. Consequently, five smart traps were deployed at five suburban sites across the canton (Figure 1, Figure 2). The municipalities were selected based on tiger mosquito densities reported by citizens:

1. Lancy (high density for the past 2-3 years)
2. Thonex (high density for the past 2-3 years)
3. Chêne-Bourg (high density since 2024)
4. Vernier (low density in 2024)

5. Versoix (none in 2024, but first sightings in the municipality at the end of the season)

Each smart trap consisted of one BG-Sentinel adult mosquito suction fan trap (Biogents AG, Regensburg, Germany) equipped with BG-Mozzibait (Biogents) attractant and with a VECTRACK sensor directly placed on the entrance of the trap (Figure 2). The BG-Mozzibait is an artificial human skin scent to attract tiger mosquitoes in combination with the attractive visual and physical features of Biogents traps.

Figure 2. The specific locations where the traps were placed. The Versoix trap also had the sensor, even though it is not visible in this image.

The traps at each site were positioned to ensure shade, nearby vegetation, protection from rain and wind, access to electricity, and reduced risk of theft.

We installed and activated the five traps on July 2, 2025. They were turned off and removed on October 3, 2025. During this period, the traps operated continuously, and the collection nets were sampled every 24 hours for five consecutive days every two weeks (see schedule in Figure 3). Consequently, the first sampling of each five-day session included the insects captured during the interval since the last sampling of the previous session (for the first session, since the traps were initially activated).

Week	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Month	Mozzibait
22	26	27	28	29	30	31	1	May / June	
23	2	3	4	5	6	7	8	June	
24	9	10	11	12	13	14	15	June	
25	16	17	18	19	20	21	22	June	
26	23	24	25	26	27	28	29	June	
27	30	1	2	3	4	5	6	June / July	Package 1
28	7	8	9	10	11	12	13	July	Package 1
29	14	15	16	17	18	19	20	July	Package 1
30	21	22	23	24	25	26	27	July	Package 1
31	28	29	30	31	1	2	3	July / August	Package 1
32	4	5	6	7	8	9	10	August	Package 1
33	11	12	13	14	15	16	17	August	Package 1
34	18	19	20	21	22	23	24	August	Package 2
35	25	26	27	28	29	30	31	August	Package 2
36	1	2	3	4	5	6	7	September	Package 2
37	8	9	10	11	12	13	14	September	Package 2
38	15	16	17	18	19	20	21	September	Package 2
39	22	23	24	25	26	27	28	September	Package 2
40	29	30	1	2	3	4	5	September / October	Package 2
41	6	7	8	9	10	11	12	October	
42	13	14	15	16	17	18	19	October	
43	20	21	22	23	24	25	26	October	
44	27	28	29	30	31	1	2	October / November	
deployment of traps									
net sampling									

Figure 3. Sampling schedule for the nets in the traps.

At each five-day collection session, the nets were placed in a container with a cotton pad soaked in alcohol to euthanize the mosquitoes and were stored at ambient temperature until the end of the session. Subsequently, the 25 nets were mailed to SUPSI, where the captured mosquitoes were counted and morphologically identified at the species and sex levels. Data analysis by ZDS is ongoing.

3. Project timeline

Planned timeline:

FLOWCHART	WHO	JUNE	JULY	AUGUST	SEPTEMB.	OCTOBER	NOVEMB.	DECEMB.	JAN. 2026
arrival of sensor	Irideon to SUPSI	week 24							
setting of traps in GE	OCAN	week 25							
samples collections	OCAN	week 26	week 29	week 33	week 38	week 42			
samples pickup from GE	SUPSI								
DB	SUPSI								
manual identification of mosquitoes	SUPSI								
analysis	ZDS								
data presentation	SUPSI								
report	SUPSI								

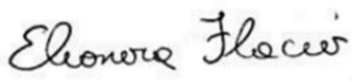
Modified timeline, due to delay in trap delivery from Spain:

FLOWCHART	WHO	JUNE	JULY	AUGUST	SEPTEMB.	OCTOBER	NOVEMB.	DECEMB.	JAN. 2026
arrival of sensor	Irideon to SUPSI	week 26							
setting of traps in GE	OCAN		week 27						
samples collections	OCAN		w. 28, 31	week 34	week 37	week 40			
samples pickup from GE	SUPSI								
DB	SUPSI								
manual identification of mosquitoes	SUPSI								
analysis	ZDS								
data presentation	SUPSI								
report	SUPSI								

References

González-Pérez, M.I., Faulhaber, B., Aranda, C.et al. Field evaluation of an automated mosquito surveillance system which classifies *Aedes* and *Culex* mosquitoes by genus and sex. Parasites Vectors17, 97 (2024). https://doi.org/10.1186/s13071-024-06177-w

Micocci, M., Manica, M., Bernardini, I. et al. An easier life to come for mosquito researchers: field-testing across Italy supports VECTRACK system for automatic counting, identification and absolute density estimation of *Aedes albopictus* and *Culex pipiens* adults. Parasites Vectors 17, 409 (2024). https://doi.org/10.1186/s13071-024-06479-z



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