

Aedes koreicus in Belgium: to spread or not to spread?



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ANTWERP

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INTRODUCTION

- Experimentally proven competent vector of chikungunya and Japanese encephalitis virus, and *Dirofilaria* [1,2]
- Vector status and host preference remain unclear + unknown how these traits will evolve in the future
- Therefore, included in the Belgian exotic mosquito monitoring since its detection in 2008 and confirmed establishment in 2009 at an industrial area in the east of Belgium (commune Maasmechelen (MM), see map below) [3,4]
- **Aim: investigate the establishment and spread of *Aedes koreicus* in Belgium**



MATERIAL & METHODS



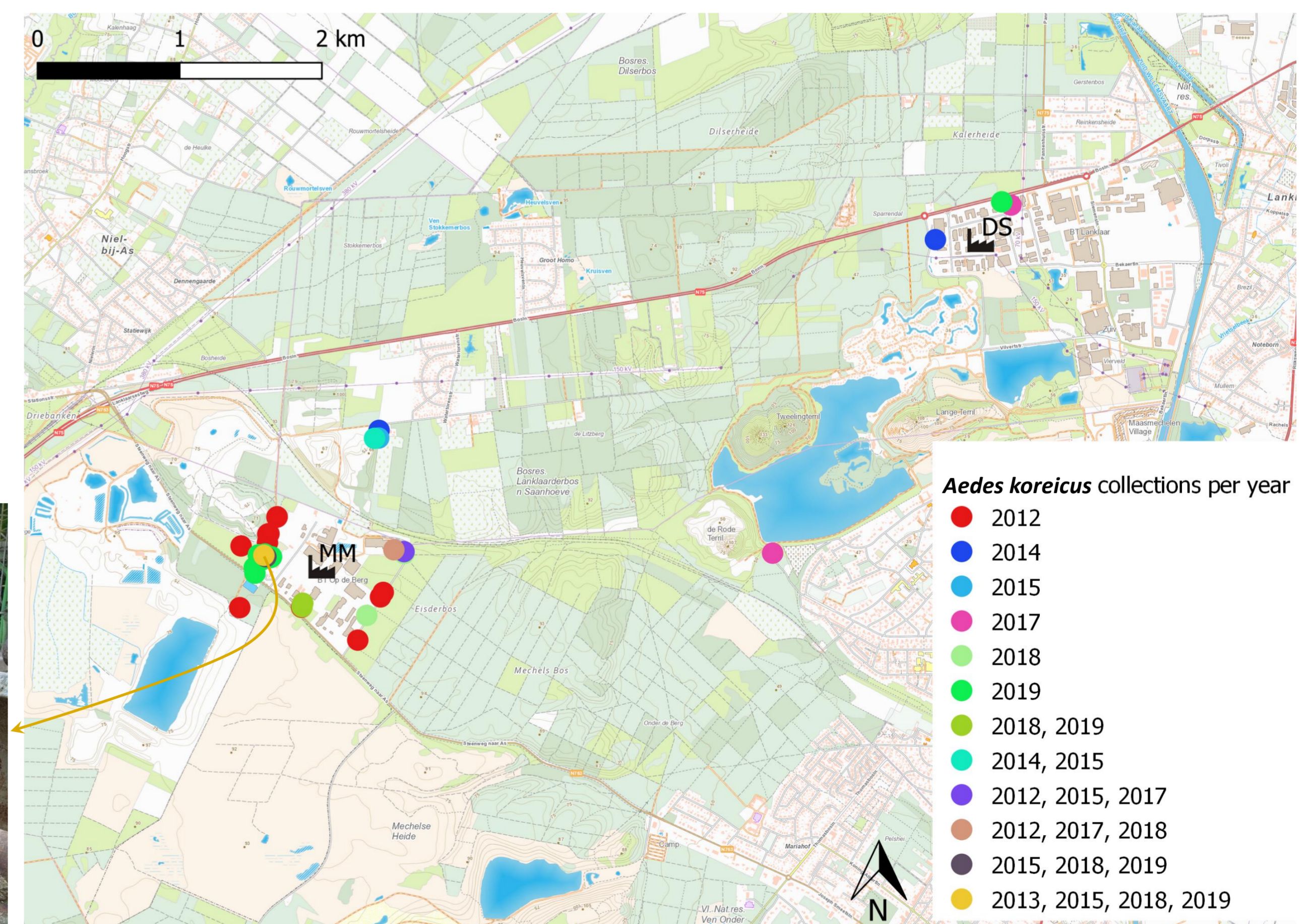
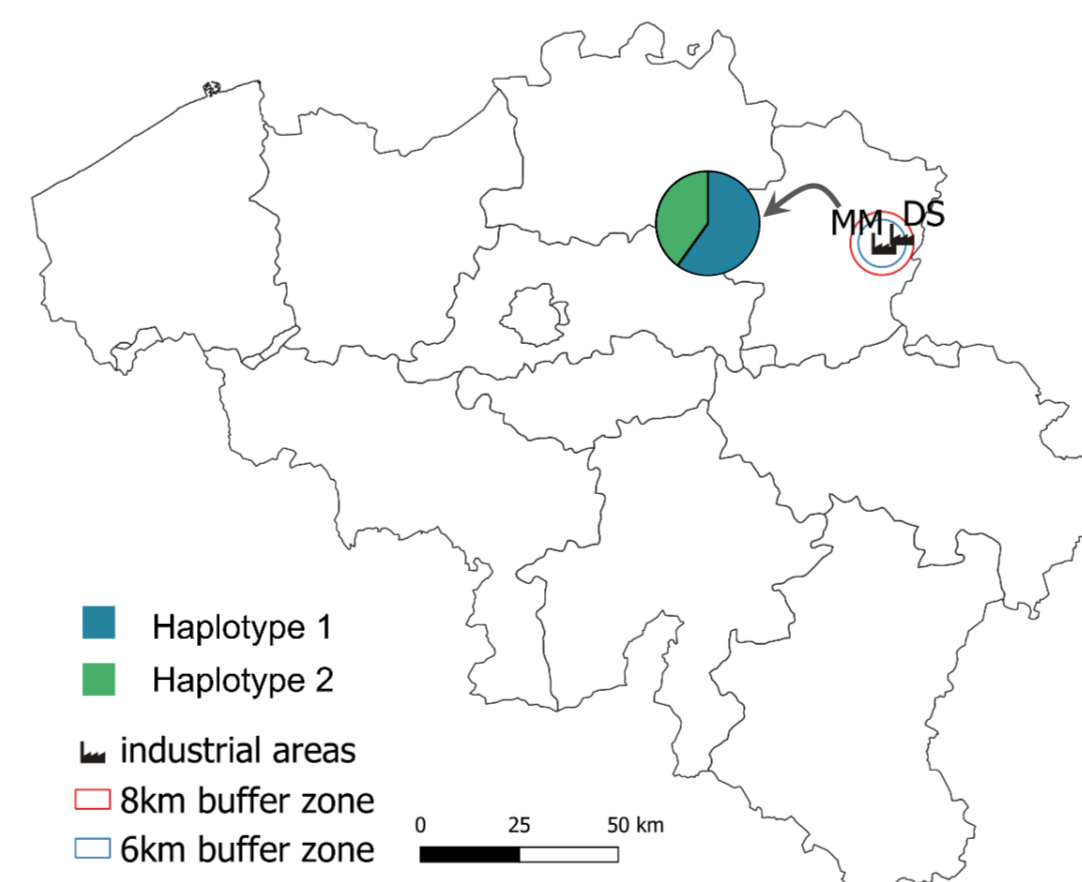
- **Longitudinal monitoring**
 - at the industrial area MM in 2012, 2018 and 2019
 - in a 6.5 km buffer zone around MM in 2012 and 2017
 - at the industrial area located 5.4 km northeast from MM (commune Dilsen-Stokkem (DS), see map below) in 2012, 2014, 2015, 2017 - 2019
- **Cross-sectional monitoring**
 - at MM and in a 5.5 km buffer zone around MM (including DS) from 2013 until 2015
 - in a 6-8 km buffer zone around MM in 2018
- In general, **adult and oviposition traps** were sampled continuously with **collections every two or four weeks**, respectively, while **larval sampling** was performed **once per month or once every two months**
- Cytochrome oxidase I (COI) gene sequencing & **haplotype investigation** (with Bayesian analysis)

RESULTS & DISCUSSION

Year	Location	Sampling perimeter ^a	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	# MMT	# GT	# BG	# BG-GAT	# Adults	# OT	% positive OT	# Eggs	# PLH checked ^b	% positive PLH	# Larvae	First detection method	In-between detection methods	Last detection method
2012	MM	1 km													2 ^c	0	0	0	8	10	0	0	17	71	246	LS	MMT, LS	LS
	DS	6,5 km at site													0	0	0	0	na	20	0	0	23	0	0	na	na	na
2013	MM	1 km													0	4 ^c	0	0	0	0	na	na	4	25	11	LS	LS	LS
	DS	at site													0	0	4 ^c	0	0	0	na	na	0	na	na	na	na	na
2014	MM	1,5 km													0	0	0	0	na	0	na	na	5	40	70	LS	LS	LS
	DS	5,5 km at site													0	0	0	0	na	0	na	na	2	0	0	na	na	na
2015	MM	1,5 km													0	0	0	0	na	0	na	na	11	45	87	LS	LS	LS
	DS	5,5 km at site													0	0	0	0	na	0	na	na	7	0	0	na	na	na
2017	MM	1,5 km													0	0	0	0	na	8	0	0	4	50	52	LS	LS	LS
	DS	6,5 km at site													0	0	0	0	na	32	0	0	21	5	8	LS	LS	LS
2018	MM	at site													1	0	1	0	2	10	0	0	1	0	0	MMT	MMT	MMT
	DS	6-8 km at site													2	1	0	2	427 ^d	0	na	na	12	67	353	LS	MMT, GT, BG-GAT, LS	MMT
2019	MM*	at site													0	0	0	0	na	0	na	na	33	0	0	na	na	na
	DS	at site													1	0	1	0	3	10	0	0	3	0	0	MMT	MMT	MMT
2019	MM*	at site													0	1	1	0	54	10	60	329	9	44	23	LS	BG, GT, LS, OT	LS
	DS	at site													1	0	1	0	2	10	0	0	4	0	0	MMT	MMT	MMT
Total																		496			329			854				

■ = sampling period, ■ = *Aedes koreicus* collection, MMT = Mosquito Magnet trap, BG = BG-Sentinel trap, GT = Frommer updraft gravid trap, BG-GAT = BG-gravid Aedes trap, PLH = potential larval habitat, LS = larval sampling, OT = oviposition trap, na = not applicable, ^aPerimeter around point of first detection at location, ^bNumber of containers checked per PLH ranged from 1 until 200 with an average of 13 containers per PLH, ^c2012: collection of one week per month (at DS and one MMT at MM), 2013: one collection of 24h, ^d3 ♀ and 7 ♂ (collected with the gravid trap) were used for the haplotype investigation, X = Sensitisation campaign in 2018 and chemical control executed in 2019 by a pest control agency hired by the Flemish government, *Chemical control was also executed in 2020 (Apr-May-Jun-Jul) and 2021 (Apr-May-Jun-Jul), but without monitoring

- **Limited spread in northeast direction, but hotspot at industrial area MM**
 - Spread hampered by open terrain of sand quarry and heath?
 - Furthest detection at industrial area DS (5.4 km) → only 1.4 km further than the furthest detection in 2009
 - Seasonal spread from MM through the forests in the east, but import through used tyre import company at DS also possible



- **Admixture and two haplotypes identified at MM**
 - Possible reintroduction event
 - Admixture between Belgium, Hungary & Italy
 - Implications for future spreading?
- **Redevelopment of the industrial area MM in 2035**
 - Important to continue the monitoring, sensitisation and control measures to minimize spreading in Belgium or abroad → reduced population in 2019 at MM

We recommend to further investigate the context-dependent vector biology, and in particular further assess the host preferences, vector competence and population genetics of *Aedes koreicus* in Europe.

[1] Schaffner et al. 2013. Clin Microbiol Infect 2013, 19 (8): 685-692; [2] Martinet et al. 2019 Viruses 11 (11): 1059; [3] Versteirt et al. 2011. Modirisk. Final report. Brussels. 152 p.; [4] Versteirt et al. 2012. J Med Entomol 49 (6): 1226-1232.

Partners

Funding