

Ecology of mosquitoes (Diptera, Culicidae) potentially vectors of arboviruses according to the kinds of animal husbandry in Belgium

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Introduction

Human activity, commercial exchanges and climate changes current and future, could favor the (re)-emergence of vector-borne diseases, by inducing changes on Culicidae populations. This study aims to determine the potential importance of agricultural environments, especially cattle farms and equestrian, to welcome and favor the proliferation of some species of mosquito responsible for transmission of arboviruses.

Material & methods

A taxonomic inventory was conducted in 2008 (III, VI and X) and 2009 (V and IX) in ten cattle farms, and in 2011 (VI-X) and 2012 (VI-IX) in six equestrian farms located in Belgium (Fig.1). The harvest of mosquitoes is based on adult trapping by CO₂-traps and on larval sampling at the level of 64 biotopes (Fig.2). Morphological (larvae L4 & genitalia ♂) and molecular identification [PCR : ITS2 (*An. maculipennis* s.l. & *An. claviger* s.l.), CQ11(*Cx. pipiens* s.l.) & ACE-2 (*Cx. torrentium*)] were performed.

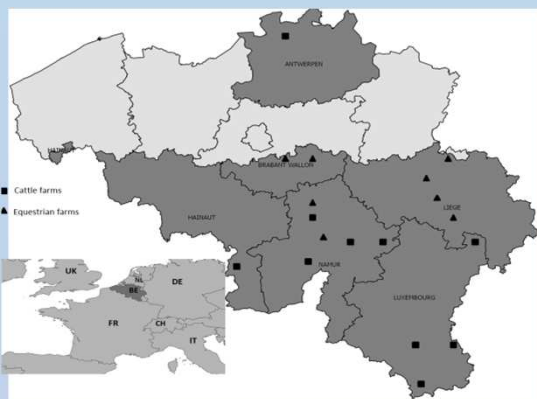


Fig. 1. Different farms inspected during inventory mosquitoes in Belgium



Fig.2. Some breeding sites studied : A-Puddle behind the stables (farm); B-Purin (liquid of manure); C-Tarpaulin cover; D-Obstacle of the race (water obstacle); E-Septic of washing; F-Watercourse (grassland); G-Puddle & hoofprints (grassland); H-water troughs; I-Rut (passage of tractor); J-Used tires; K-Drain behind the stables

Results

The morphotaxonomic and molecular study of larvae and genitalia, have allowed to identify eleven species:

Genus	Species
<i>Aedes</i>	<i>Ae. cinereus</i> Meigen, 1818
<i>Anopheles</i>	<i>An. claviger</i> s.s Meigen, 1804; <i>An. maculipennis</i> s.s. Meigen, 1818 <i>An. messae</i> Falleroni, 1926
<i>Coquillettidia</i>	<i>Cq. richiardii</i> Ficalbi 1889
<i>Culex</i>	<i>Cx. torrentium</i> Martini, 1925 <i>Cx. territans</i> Walker, 1856 <i>Cx. pipiens pipiens</i> L., 1758 <i>Cx. pipiens molestus</i> L., 1758 <i>Cx. hortensis</i> Ficalbi, 1889
<i>Culiseta</i>	<i>Cs. annulata</i> Schrank, 1776 <i>Cs. morsitans</i> Theobald, 1901
<i>Ochlerotatus</i>	<i>Oc. geniculatus</i> Olivier, 1791 <i>Oc. cantans</i> Meigen, 1818

Abundance of species of Culicidae (larvae) inventoried in the equestrian farms' breeding sites

Breeding sites	<i>Cx.tor.</i>	<i>Cx.ter.</i>	<i>Cs.ann.</i>	<i>Cx.hor.</i>	<i>Cx.pip.s.l.</i>	<i>An.cla.</i>	<i>An.mac.sl</i>
Artificiel Tank	211	0	0	0	166	0	263
Jar concrete	9	0	14	0	132	0	0
Water troughs	1377	0	414	230	1374	124	358
Tarpaulin	76	0	5	0	44	0	0
Sewer	1	0	1	0	14	0	0
Tires	432	0	77	0	483	0	0
Can	1452	0	32	0	960	0	49
Total	3558	0	543	230	3173	124	670
Natural Watercourse	49	0	8	0	308	97	32
Hoofprints horse	0	0	0	0	56	0	0
Puddle	683	0	0	0	3235	0	247
Drain	115	0	9	0	89	0	0
Rut	708	0	28	0	3258	2	98
Pond	459	34	104	0	6808	1	168
Total	2014	34	149	0	13754	100	545

Discussion & Conclusion

- Among the 57,680 individuals examined, *Cx. pipiens* s.l., *Cx. torrentium* and *Cs. annulata* are the dominants species and ubiquitous
- Water troughs, used tires & ponds are the most favorable habitats for larval development of Culicidae in the both kinds of animal husbandry
- Species potentially vectors of arboviruses and who can cause an epidemiological problems in livestock & equestrian farms are *Cx. pipiens* s.l (West Nile Virus & Rift Valley Virus), *Cx. torrentium* (Sindbis virus), *Cs. annulata* (Equine infectious anemia) & *Cq. richiardii* (nuisance & WNV).