Diversity and breeding sites of mosquitoes (Diptera, Culicidae) potentially vectors of arboviruses in Belgian equestrian farms

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Introduction

Environment and climate change, 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 the livestock farms, especially equestrian, to welcome and favor the proliferation of certain species of mosquito responsible for transmission of arboviruses.

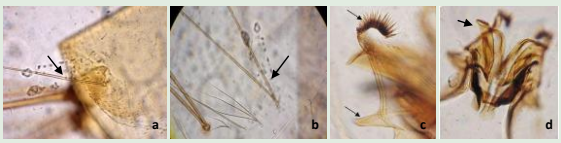
Material & methods

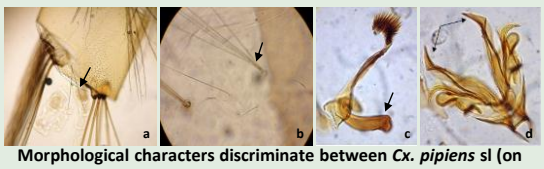
A taxonomic inventory was conducted in 2011 (from June to October) in six equestrian farms located in Belgium. Mosquito larvae were sampled in 124 various aquatic breeding sites using the method of Dipper. The CO_2 baited trap Mosquito Magnet Liberty Plus was used for adult mosquito sampling. The analysis of the morphotaxonomy of larvae (L4) and genitalia (♂) were based on the use of identification keys (1) and (2). For the molecular identification, three fragments interest for DNA were amplified by PCR : ITS2 (*An. maculipennis s.l.* & *An. claviger s.l.*) (3,4), CQ11(*Cx. pipiens s.l.*) (5) & ACE-2 (*Cx. torrentium*) (6).

Results

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

Genus	Species
Anopheles	*An. claviger s.s* Meigen, 1804; *An. maculipennis s.s.* Meigen, 1818 *An. messae* Falleroni, 1926
Coquillettidia	*Cq. richiardii* Ficalbi 1889
Culex	*Cx. torrentium* Martini, 1925 *Cx. territans* Walker, 1856 *Cx. pipiens pipiens* L., 1758 *Cx. pipiens molestus* L., 1758 *Cx. hortensis* Ficalbi, 1889
Culiseta	*Cs. annulata* Schrank, 1776 *Cs. morsitans* Theobald, 1901





Morphological characters discriminate between *Cx. pipiens* sl (on top) and *Cx. torrentium* (below) : a caudal hair 1-X, b abdominal hair 1-III, c basal arm of the paraproct, d dorsal arm of the phallosome

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

Values of the Shannon-Weaver index (H '), of the maximum diversity index (H'max.) and of the species evenness index (E) of Culicidae (larvae) sampled in 2011

Station	Chénée	Gembloux	La Reid	Malonne	Sprimont	Warsage
S	4	5	4	3	7	3
s	2,75	3,5	2,5	3	4,25	2
H max	2,0	2,3	2,0	1,6	2,8	1,6
H'	0,81	0,84	0,64	0,29	0,51	0,36
E	0,40	0,36	0,32	0,19	0,18	0,22

Abundance of species of Culicidae (larvae) inventoried in each breeding sites

Breeding sites		*Cx.tor.*	*Cx.ter.*	*Cs.ann.*	*Cx.hor.*	*Cx.pip.s.l.*	*An.cla.*	*An.mac.sl*
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 hors	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 24893 individuals examined in 2011, *Cx. pipiens sl* and *Cx. torrentium* represent 68.00% & 22.38% respectively of total harvest;
- At the horse farms, water troughs and ponds are the most favorable habitats for larval development of Culicidae;
- The species potentially vectors of arboviruses and who can cause an epidemiological problems in Livestock & equestrian farms are ***Cx. pipiens sl*** (West Nile Virus & Rift Valley Virus), ***Cx. torrentium*** (Sindbis virus) & ***Cs. annulata*** (Equine infectious anemia).

References

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