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Variables identified as predictors of *Culex pipiens* density during the 2010 entomological surveillance for West Nile disease in Veneto region, north-eastern Italy

Montarsi F.[1], Ciocchetta S.[1], Masin E.[1], Scremin M.[1], Mulatti P.[1], Russo F. [2], Martini S. [3], Marangon S.[1], Capelli G.[1]

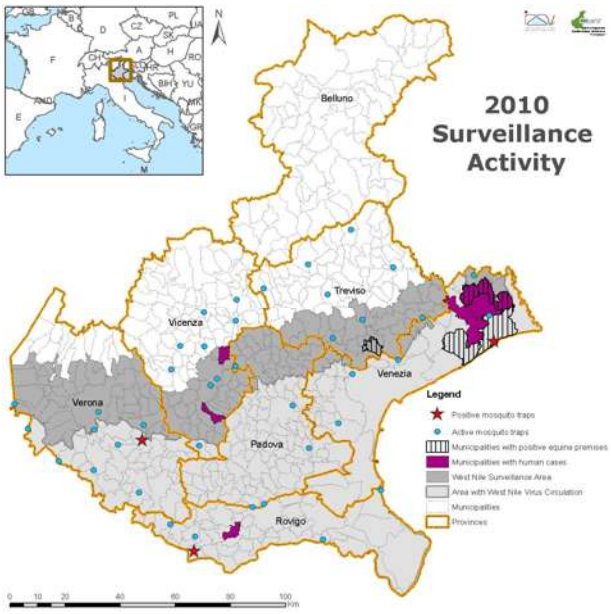
1Istituto Zooprofilattico Sperimentale delle Venezie, Legnaro (PD, Italy); 2Entostudio snc, Brugine (PD), Italy; 3 Public Health and Screening Service,Veneto Region, Italy

Introduction - In north-eastern Italy, following an outbreak of West Nile virus (WNV) infection involving humans, domestic animals and wild birds in 2008, a surveillance program was implemented. During 2010, the viral circulation in Veneto region was confirmed by clinical cases (6 humans and 4 horses) and by the WNV detection in 10 *Culex pipiens* pools. A high correlation among localities with viral circulation and *Cx.pipiens* density was noted. Therefore, trapping sites were ecologically characterized and a statistical analysis was performed aimed to find potential predictors of *Cx.pipiens* density.

Materials and Methods - Entomological monitoring was performed from May through November in 43 sites. CDC-CO2 traps were used for one night every 15 days. A buffer of 4 km surrounding each trap was considered and landscape data extracted (European Corine land cover 2006). Sites were then characterized as rural (areas devoted to agriculture), artificial (dominance of urbanized and industrial areas), semi-natural (forested and open semi-natural landscape) and humid areas (internal humid areas like ponds, marshes and lagoons) based on the dominant landscape type in each buffer. Others variables considered were altitude (range -2/221 m asl), presence of wild and domestic animals and disinfestations activity. Associations between variables and *Cx.pipiens* density were screened using the GLM (General linear model) procedure available in the SPSS software version 15.0 for Windows.

Site	Municipality	Province	X - GBO	Y - GBO	m (asl)	Habitat
174	Valdobbiadene	Treviso	1734884	5085693	178	SAgr
175	Volpago del Montello	Treviso	1741962	5074813	108	B
176	Borso del Grappa	Treviso	1718877	5077079	200	SAgr
177	Revine Lago	Treviso	1750481	5098176	221	B
178	Codognè	Treviso	1765811	5084749	25	SAgr
179	Salgareda	Treviso	1776464	5066173	0	SAgr
180	Quinto di Treviso	Treviso	1743853	5058816	18	SAgr
181	Treviso	Treviso	1754732	5065349	17	SArt
182	Pojana Maggiore	Vicenza	1695463	5019859	13	SAgr
183	Arcugnano	Vicenza	1699522	5041647	26	SAgr
184	Vicenza	Vicenza	1701903	5043998	30	SAgr
185	Dueville	Vicenza	1697336	5055717	48	SAgr
186	Zugliano	Vicenza	1697229	5068062	128	Veg
187	Malo	Vicenza	1688531	5056007	82	SAgr
188	Trissino	Vicenza	1685246	5047451	114	SAgr
189	Bassano del Grappa	Vicenza	1709021	5072943	139	B
190	Nove	Vicenza	1708743	5065143	74	SAgr
165	Casaleone	Verona	1673733	5002876	12	SAgr
167	Oppeano	Verona	1666013	5020145	27	SAgr
191	**Ronco all'Adige**	**Verona**	**1674768**	**5022059**	**16**	**SAgr**
192	Peschiera del Garda	Verona	1628539	5034960	68	ZU
193	Erbè	Verona	1657189	5011075	23	ZU
194	Valleggio sul Mincio	Verona	1633328	5025952	60	SAgr
195	Nogarole Rocca	Verona	1644575	5014296	34	SAgr
196	Belfiore	Verona	1675413	5027342	19	SAgr
197	Verona	Verona	1658910	5031975	41	SAgr
173	Buttapietra	Verona	1657438	5025643	39	SAgr
18	Brugine	Padova	1735254	5018945	3	SAgr
12	Padova	Padova	1729411	5034466	10	SArt
10	Gazzo Padovano	Padova	1708453	5048656	31	SAgr
9	Papozze	Rovigo	1740423	4986029	-1	SAgr
16	Boara Pisani	Rovigo	1718990	4998905	4	SAgr
14	Trecenta	Rovigo	1693982	4987105	3	SAgr
162	**Ficarolo**	**Rovigo**	**1693624**	**4981967**	**5**	**SAgr**
163	Castelnovo Bariano	Rovigo	1684969	4991435	4	SAgr
15	Vescovana	Rovigo	1714791	4997667	9	SAgr
8	Rosolina	Rovigo	1761362	5003825	1	ZU
4	Venezia	Venezia	1750990	5045771	2	SAgr
3	Quarto d'Altino	Venezia	1767655	5050860	0	SAgr
1	**Caorle**	**Venezia**	**1802344**	**5057715**	**3**	**SAgr**
198	Cinto di Caomaggiore	Venezia	1794964	5081872	4	SAgr
199	Concordia Sagittaria	Venezia	1800536	5066985	-2	SAgr
6	Campagna Lupia	Venezia	1745855	5027970	-1	ZU

In red positive mosquito traps. SAgr: agricultural surface, ZU: wetlands, B: wood, Veg: shrubs, SArt: urban surface



Results – Overall, 137965 mosquitoes of 16 species were collected, with a mean mosquito density/capture of 251.76. The majority of mosquitoes (93%) were represented by *Cx.pipiens* (87%), *Ochlerotatus caspius* (3.5%) and *Aedes vexans* (2.5%). The best predictors of *Cx.pipiens* density were: altitude (higher density below 60 m asl) followed by habitat type (i.e. rural and humid areas) and presence of horses (and not cattle or dogs and cats). There was a significant interaction between habitat and horses as effect on mosquito density. The presence of wild animals, both mammals and birds, and disinfestations activity seemed not to affect the mosquito density.

Conclusions – *Cx.pipiens*, the main vector of WNV in north-eastern Italy, is widespread in all the sites monitored. Apart from climatic variables, such as temperature and precipitation, which have been demonstrated so far to modulate the mosquitoes density and their pattern along the year, other variables can be considered as predictor of *Cx.pipiens* density. In the area monitored, rural and humid areas represent the best habitat, unlike other studies in USA that identified urban and peri-urban sites as the most suitable sites for this species. The data also suggest that horses may be more attractive for *Cx.pipiens* compared to cattle and pets, offering new hints for experimental studies. Although *Cx.pipiens* is normally considered ornithophilic, an association with wild or domestic birds presence was not found, however no data on density and species composition were available. Finally, the absence of evident effects of disinfestations on mosquito density stresses the importance of using standard methods to determine the efficacy of disinfestations.

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