

## TEMPORAL PATTERNS OF *CULEX PIFIENS* AND *AEDES ALBOPICTUS* IN NORTHERN ITALY: THE EFFECT OF INTERSPECIFIC COMPETITION

Giovanni Marini <sup>1,2\*</sup>, Giorgio Guzzetta <sup>3</sup>, Frederic Baldacchino <sup>2</sup>, Daniele Arnoldi <sup>2</sup>, Fabrizio Montarsi <sup>4</sup>, Gioia Capelli <sup>4</sup>, Annapaola Rizzoli <sup>2</sup>, Stefano Merler <sup>3</sup>, Roberto Rosà <sup>2</sup>

1: Department of Mathematics, University of Trento, Italy;

2: Department of Biodiversity and Molecular Ecology, Research and Innovation Centre, Fondazione Edmund Mach, San Michele all'Adige (TN), Italy;

3: Fondazione Bruno Kessler, Trento, Italy;

4: Laboratory of Parasitology, Istituto Zooprofilattico Sperimentale delle Venezie, Padova, Italy.

\*giovanni.marini@fmach.it

*Aedes albopictus* and *Culex pipiens* larvae reared in the same breeding site compete for resources, with an asymmetrical outcome that disadvantages only the latter species. The impact of these interactions on the overall ecology of these two mosquito species has not yet been assessed in the natural environment. In the present study, the temporal patterns of adult female mosquitoes from both species were analyzed in northeastern Italy, and substantial temporal shifts between abundance curves of *Cx. pipiens* and *Ae. albopictus* were observed in several sites. To understand which are the drivers of observed shifts, we developed a density-dependent mechanistic model that takes explicitly into account the effect of temperature on the development and survival of both species. In addition, we included into the model the effect of asymmetric interspecific competition, by adding a mortality term for *Cx. pipiens* larvae proportional to the larval abundance of *Ae. albopictus* in the same site. A model calibration was performed through a Bayesian statistical analysis using weekly capture data collected in our study sites in Veneto and Trentino regions in 2014 and 2015. In several cases, our results show that observed shifts were due to the early decline of *Cx. pipiens* caused by the concurrent rise in abundance of its competitor, and that the competition effect was enhanced by higher abundance of either species. We estimate that competition may reduce *Cx. pipiens* abundance at some sites up to 75%. However, in some cases temporal shifts can also be explained in the absence of competition between species resulting from a “temporal niche” effect, when the optimal fitness environmental conditions (e.g. temperature, photoperiod) for the two species are reached at different times of the year. These findings demonstrate the importance of taking into account ecological interactions and, in particular, competition between mosquito species in temperate climates, with important implications for the invasion dynamics of the alien species and for risk assessment of mosquito transmitted pathogens, as well as the implementation of effective control measures.