Population Estimate using a Trap-Insect Model.

Roumen Anguelov[1], <u>Claire Dufourd</u>[1], Yves Dumont[2]
[1] Department of Mathematics and Applied Mathematics, University of
Pretoria, Pretoria, South Africa
{roumen.anguelov, claire.dufourd}@up.ac.za
[2] CIRAD, Umr AMAP, Montpellier, France
yves.dumont@cirad.fr

In order to develop efficient biological control of pest insects such as mosquitoes or fruit flies, the knowledge of the population size is essential. Typically, the only field data available is obtained using traps and/or mark-release-recapture experiments [1]. Field experiments can be time consuming and costly to conduct, with no guarantee on the usefulness of the data collected for reliable estimation of the population size [2]. In order to improve and even simplify the process of field data collection and experiments, TIM, a trap-insect model, is built [3]. An equation governing the dynamics of insects responding to attractive traps is coupled to an equation modelling the spread of a chemical attractant released from the traps, which yields a chemotaxis PDE model. Numerical simulations are done using a finite elements approximation on a unstructured mesh refined near the traps, and enable us to propose and test a protocol for population parameter estimation.

References

[1] L.C. Gouagna, J.S. Dehecq, D. Fontenille, Y. Dumont, and S. Boyer, *Seasonal Variation in size estimates of Aedes albopictus population based on standard Mark-Release-Recapture experiments in an urban area on Runion Island*, Acta Tropica, 143 (2015): 8996.

[2] C. Dufourd, C. Weldon, R. Anguelov, and Y. Dumont, *Parameter identification in population models for insects using trap data*, Biomath 2 (2013).

[3] R. Anguelov, C. Dufourd and Y. Dumont, *Simulation of coupled chemotaxis model for insect-trapping using a finite element approach*, in review in Mathematics and Computers in Simulations.