MODELLING THE POPULATION DYNAMICS OF AN INSECT PEST

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The fruitfly Drosophila *suzukii* is a recent (2008-2009) import from East Asia into Europe and North America, where it is causing serious damage to soft fruit cultivation. Because of the economic impact, a large number of laboratory and field studies have been carried out on Drosophila *suzukii*, that have been used also in some demographic models.

I will show the application of the modelling framework of physiologically structured population to existing data. An almost equivalent formulation is through delay differential equations with time-dependent delays. Laboratory data provide estimates of the dependence of demographic parameters on temperature and humidity. Using these relations together with observed field temperatures provide population projections, that elucidate differences among years and sites, in partial agreement with field catches.

In order to apply the model to field data, larval competition and attractiveness of traps are included, both related to seasonal availability of fruits. I will show model fit to trapping data of 2014-16 in Trentino, using realistic (albeit somewhat arbitrary) fruit functions. An interesting result is that data from traps set in parks and woodlands at low elevation are consistent with models only if it is assumed that large migrations occur to and from orchards at higher elevation. Preliminary results from mark-recapture experiments indeed support the assumption, and suggest the use of a spatially structured model.

Finally, I will show some results from a simplified model that includes also a parasitoid species in order to explore potential effects of parasitoid release.