Hierarchical Bayesian analysis of a metapopulation spatiotemporal dynamic. Application to oilseed rape feral populations.

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In fragmented landscape, a population can be considered as a metapopulation: composed by a set of subpopulations distributed on different habitat patches.

We study feral populations (populations escaped from fields present on road sides). We consider that they constitute a metapopulation distributed along the road network, defining patches as road segments. Patches neighbourhood is determined by the road network. Fields and loss during transport constitute external sources of individuals.

We design a discrete-time Markov model to describe the individual density on each patch at each time. The transitions probabilities model hierarchically: (i) patches favourability (unfavourable patches are empty) and (ii) the number of individuals dispersed on patches.

The transitions probabilities are variable in time and space. They depend also of environmental covariables. Parameters are inferred using a Bayesian approach.

We apply this model to estimate the parameters of the dynamic of oilseed rape populations observed in a large-scale study in the agricultural landscape of Selommes. During several years, location and size of these populations were recorded as the location of oilseed rape fields. We thus quantify the contribution of the different sources to the viability of the metapopulation and their spatiotemporal relations.