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The spatial dynamics of the diphenic planthopper

We study the spatial dynamics of a wing diphenic insect species (when two phenotypes can arise from the same genotype) where the size of wings can vary largely, from almost inexistent (brachypterous) to fully developed (macropterous).

Macropterous individuals are born only when the total density is higher than a certain value. This induces a density-dependent diffusion of the species.

We construct a stage structured (nymphs and adults) model, with adults further sub-divided in macropterous and brachypterous. Space is introduced explicitly by means of diffusion equations, with the diffusion constant of the macropterous sub-population being much higher than the others.

We focus of the dynamics originating from an initially small and concentrated population, which is shown to expand, with macropterous individuals as predecessors of the other stages. The invasion front displays a particular form, originating from the stage-structure of the model.