

Stage structure in mutualistic interactions

Mutualism is one of the three interaction types between species in ecology. It is broadly defined as an association that reciprocally benefits the interacting species. Understanding the consequences of mutualism is crucial for ecosystem management. However, mutualism is still poorly understood compared with interactions that negatively affect species, such as predation. In this project, the candidate will investigate the effect of stage structure in mutualistic interactions.

Indeed, many species go through different stages during individual growth, which affects their diet, habitats, and behaviours. For instance, in many pollination mutualisms that describe the relationship between a plant and a pollinating animal, pollination arises only during the adult stage of both species. The species can engage in predator-prey relationships during their juvenile stage, with the animal (larvae) feeding on the plants.

In this project, the candidate will develop and analyse a stage-structured mutualism model and compare the model with well-known mutualism models without stage-structure.

Ultimately, the model will take the form of an autonomous system of differential equations. The project will enhance the candidate's understanding of ODE, DS, numerical methods, and their applications. The candidate will also gain experience in scientific programming.