Ecological Coupled Lattice Models

Background.
Lattice based models are relatively simple mechanisms for introducing spatial structure into population models. Such models were extensively used in the 1990's and provided deep insights into the role of spatial structure, as well as many beautiful patterns. However, with modern computers it is now possible to examine these systems in far more detail.

Objectives.
The basic objectives of this project are to investigate (through simple simulation) the range of local and global dynamics that can arise when simple discrete-time models are embedded within a lattice. The simple Ricker map and the Nicholson-Bailey model are prime examples of such models that could be investigated.

Techniques
The main techniques will be programming simple deterministic spatial discrete-time models and the analysis of model output. The application of any techniques from dynamics-systems theory to the models would be highly beneficial but not essential.

Deliverables
The main deliverable will be to understand and describe the local and global dynamics of these lattice based models, and if possible to explore bifurcations in parameter-space.

Downstream Users
The work has both theoretical appeal and may provide deeper insights into population-level processes

PhD project.
This work could be readily extended into a PhD project. More theory could be developed; more realistic applications considered; real-world data on could be analysed and compared to model results.

Relevant Literature.
Chate, H and Manneville P. 1992 Collective Behaviours in Spatially Extended Systems with Local Interactions an Synchronous Updating. *Progress in Theor. Phys.* **87** 1-60

Hassell, M., Commins, H. and May, R.M. 1991 Spatial Structure and Chaos in Insect Population Dynamics. *Nature* **353** 255-258