CHAPTER 1

STABILITY

1.1 Motivation

At the begining of chapter **??** we saw that our simulated communities collapse in the case of no immigration. We defined the term *community collapse* as the extinction of all non-basal species from the landscape[1]. It appears that immigration is required for the persistence of non-basal species, at least for the default parameters. This already tells us something interesting about the model, and potentially has something more profound to say about the real world (see discussion in sections 1.2, **??**. In this chapter we use the individual-based model (IBM) to explore other factors contributing to the stability of simulated communities. As previously we contextualise the results using the current literature, and attempt to draw conculsions about mechanisms that may be present in the real-world[2]

To investigate factors contributing to community stability, we must define what is meant by stability. This is not an easy task and is far beyond the scope of a single thesis. In fact, as we shall see in section 1.2, there is much disagreement between eocloigists from different backgrounds as to what is meant by stability. In the work up to this point, stability has been a key consideration and we have defined and used a number of different metrics that are commonly used to measure stability. In what follows we explicitly compare to different stability concepts used in ecology.

Before going into the details we note that the most general point about stability is that it is a common property of real-world ecosystems, and that it is a good thing. A lack of stability implies the loss of speices, wildly varying population dynamics, extreme responses to extrinsic disturbances. Thinking about these prpereties, ecosystems seem remarkably stable through time,

[1] Although we can imagine the more extreme form of collapse, where all species go extinct due to over-feeding. Will we look at this?

[2] Hypothesis generation. Suggest experimental work?

and able to abosrb large disturbances before we see damage beiong done[3] We do not undertsand how nature is able to do this.

1.2 Literature Review

- What is stability!! (big topic)
- Immigration as an important mechanism behind stability/persistence
- Network structure as a contributing factor to stability

Coming from a background in physics, me two underlying images associated with stabilty were that of the stable isotope and that of a stable dynamical system. In the former case the idea is a system that is unlikely to change it's current states...deterministic system that has an attracting point or limit-cycle. Stochastic systems, steady state. Robustness to perturbations. Peristence.

1.3 Persistence without immigration?

1.4 Why are some networks more stable than others?

Chapter on ecosystem stability, with focus on this model? (Stability is implicitly involved in all the work up to this point, so does not constitute a separate chapter?)

Or chapter on inferring species interaction strengths from time series.

From Dani re: community collpase at low IR : This may be different for different parameter values or if we assume that phenotypic plasticity (which can lead to plasticity in the interactions, so that the 1 and 0 in the interaction matrix can change) in closed systems occurs. However, these mechanisms are not in place in our model.

[3] Of course nature is complex and there are counter examples to all of these e.g. wild population dynmics of plankton, and yet marine communites appear stbale and constant in other way.

Bibliography