Introduction

Paragraph 1 : multiple states and regime shifts

Paragraph 2: multiple life strategies and how they impact community ecology

Two classical observations from microbiology : (1) Microbes display multiple growth strategies and heterogeneous populations ; (2) Communities occur in more then one configuration often display alternative types. Local or global stability ?

Multistability : the dynamic landscape, like a marble or like a pinball machine ?

Enterotypes

Even from the direct evidence of a rugged surface in community landscape one cannot conclude that alternative community states exist : these may result from an abrupt but still continuous response to environmental parameters

Community configurations Vaginal, gut, and oral enterotypes, cancer microbiome

Information about the environment/bet hedging and memory of the past

Kussel & Leibler 2005 : metabolic strategies of clonal population

Phenotype switching mechanisms

Growth strategy of microbes in mixed carbon sources

Catabolite repression/persistent mechanisms

Discussion : implication for manipulating communities

Remarkable quantitative agreement

Discussion

Models become simpler as the basic mechanisms are better understood ; The existence of multistability is a longstanding debate in ecology. Historically, this debate is a caricature example for the importance of the importance of small-scale controllable system to help us dissect the mechaistic properties of the complex natural ones. Already in the 1980s Connell and Souze mocro-ecological systems we at a

Rather than a debate about labels

The separation between system variables and environmental parameters may be difficult to distinguish, confusion of contrasting states as alternative states. By based on some important kinetic properperties of the system

Positive feedback