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Stabilizing factors in spatially structured food webs

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Introduction

Food webs found in nature endure variable environments despite model predictions of diversity leading to instability and high extinction risks.
Contradictions may be explained by lack of stabilizing mechanisms in models. Mechanisms such as asynchrony and dispersal.

Aim

Investigate the effects of :

- environmental variance
- environmental response
- dispersal

on food web stability

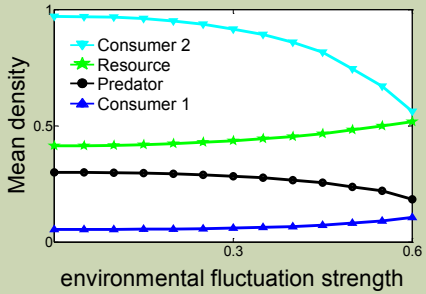
The food web

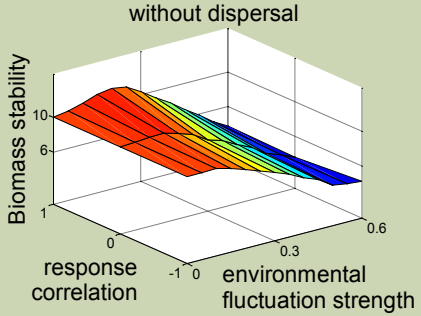
Development of model used by Vasseur and Fox, 2007.

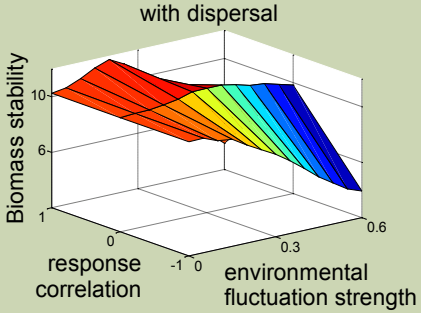
- logistic growth of resource
- asynchronous consumers
- coloured environmental variation on consumers
- dispersal of mass-action mixing

Results

	Env fluctuation strength	Env redness	dispersal
	0 to 0.6	0 to 0.6	
Mean biomass	↘	-	+
Variance	↗	+	-
Stability	↘	-	+
Extinction risk	↗	+	-







Discussion

Food web resistance was enhanced with increasing environmental variance due to enlargement of lowest species density and redistribution of extinction risk proportions.

Stabilization during dispersal and uncorrelated response results from mass-action mixing's equalizing effect. Dispersal enable a rescue effect between subpopulations.

Conclusions

Dispersal stabilizes food webs

Environmental variation caused

- increase of rare species
- decrease of common species

A large population today may not be an insurance for future climate with increased environmental variance!

Ref: Vasseur & Fox 2007. Environmental fluctuations can stabilize food web dynamics by increasing synchrony. Ecology Letters 10: 1066-1074.