

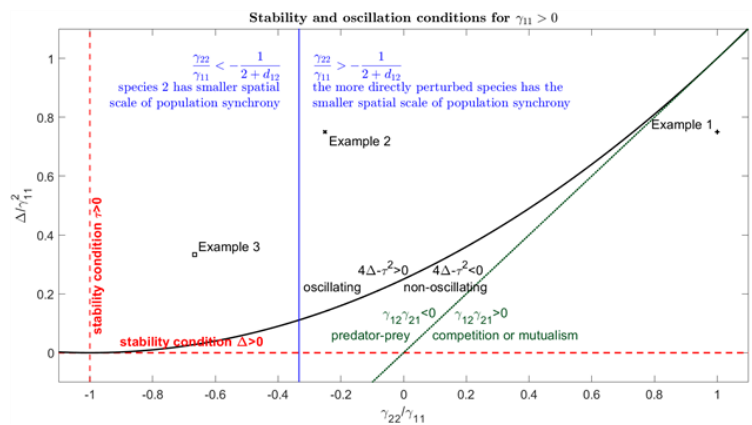
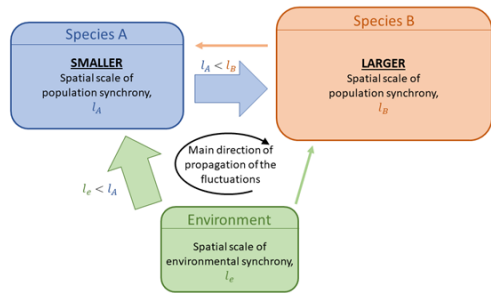
# Spatial scales of population synchrony generally increases as fluctuations propagate in a two species ecosystem

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The spatial scale of population synchrony gives the characteristic distance at which the population fluctuations are correlated. Therefore, it gives also the characteristic size of the regions of simultaneous population depletion, or even extinction. Single-species previous results imply that the spatial scale of population synchrony is equal or greater (due to dispersion) than the spatial scale of synchrony of environmental fluctuations. Theoretical results on multispecies ecosystems points that interspecies interactions modify the spatial scale of population synchrony. In particular, recent results on two species ecosystems, for two competitors and for predator-prey, point that the spatial scale of population synchrony generally increases as the fluctuations propagates through the food web, i.e., the species more directly affected by environmental fluctuations presents the smaller spatial scale of population synchrony. Here, we found that this behaviour is generally true for a two species ecosystem. The exception to this behaviour are the particular cases where the population fluctuations of one of the species does not damp by its own, but requires a strong transfer of the fluctuation to the other species to be damped. These analytical results illustrate the importance of applying an ecosystem rather than a single-species perspective when developing sustainable harvestings or assessing the extinction risk of endangered species.

Spatial scales of population synchrony increases along the main direction of propagation of the fluctuations along the food chain,  $l_e < l_A < l_B$



## References

[1] M. Á. Fernández-Grande, F. J. Cao-García, Spatial scales of population synchrony generally increases as fluctuations propagate in a two species ecosystem, arXiv:2012.11043 (2020).