

# IS DISPERSAL ALWAYS BENEFICIAL TO CARRYING CAPACITY? NEW INSIGHTS FROM THE MULTI-PATCH LOGISTIC EQUATION

Roger Arditi<sup>1</sup>, Claude Lobry<sup>2\*</sup>, and Tewfik Sari<sup>3</sup>

<sup>1</sup>University of Fribourg, Department of Biology,  
Chemin du Musee 10, 1700 Fribourg, Switzerland

<sup>2</sup>CRHI, University of Nice, France

<sup>3</sup>IRSTEA, UMR Itap, 361 rue Jean-François Breton, 34196 Montpellier Cedex 5, France

roger.arditi@unifr.ch , lobrinria@wanadoo.fr (\*corresponding author), tewfik.sari@irstea.fr

The standard model for the dynamics of a fragmented density-dependent population is built from several local logistic models coupled by migrations. First introduced in the 1970s and used in innumerable articles, this standard model applied to a two-patch situation has never been completely analysed. Here, we complete this analysis and we delineate the conditions under which fragmentation associated to dispersal is either beneficial or detrimental to total population abundance. Therefore, this is a contribution to the SLOSS question. Importantly, we also show that, depending on the underlying mechanism, there is no unique way to generalize the logistic model to a patchy situation. In many cases, the standard model is not the correct generalization. We analyse several alternative models and compare their predictions. Finally, we emphasize the shortcomings of the logistic model when written in the r-K parameterization and we explain why Verhulst's original polynomial expression is to be preferred. [1, 2]

## References

- [1] R. Arditi, C. Lobry and T. Sari. (2015). *Is dispersal always beneficial to carrying capacity? New insights from the multi-patch logistic equation*, Theoretical Population Biology, **106**, 45–59.
- [2] Arditi, R., L.-F. Bersier, and R. P. Rohr. (2016). *The perfect mixing paradox and the logistic equation: Verhulst vs. Lotka*, Ecosphere, 7 (11):e01599. 10.1002/ecs2.1599