Survival and fragmentation of single species populations

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Fisher equation is a standard starting point for the study of the temporal evolution of single-species population distributions, since it contains the elementary ingredients: logistic growth and random dispersal through a normal diffusion term. We generalize this equation to include nonlocality in the interspecific competition, that is a known mechanism for pattern formation. We also include power-law nonlinearities in growth and diffusion rates, to mimic the possibility of feedback in their regulatory mechanisms, giving rise for instance to anomalous diffusion. Additionally, the effect of the spatiotemporal heterogeneities of the environment can be represented by fluctuations in the model parameters, and appropriate boundary conditions. Our aim is to foresee how power-law nonlinearities set critical conditions for population survival and for pattern formation and shaping (fragmentation).

References

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