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**Life and death near a windy oasis.** (English) Zbl 0999.92038

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Summary: We propose a simple experiment to study delocalization and extinction in inhomogeneous biological systems. The nonlinear steady state for, say, a bacteria colony living on and near a patch of nutrient or favorable illumination (“oasis”) in the presence of a drift term (“wind”) is computed. The bacteria, described by a simple generalization of the Fisher equation, diffuse, divide  $A \rightarrow A + A$ , die  $A \rightarrow 0$ , and annihilate  $A + A \rightarrow 0$ .

At high wind velocities all bacteria are blown into an unfavorable region (“desert”), and the colony dies out. At low velocity a steady state concentration survives near the oasis. In between these two regimes there is a critical velocity at which bacteria first survive. If the “desert” supports a small nonzero population, this extinction transition is replaced by a delocalization transition with increasing velocity. Predictions for the behavior as a function of wind velocity are made for one and two dimensions.

**MSC:**

[92D40](#) Ecology

[35Q92](#) PDEs in connection with biology, chemistry and other natural sciences

Cited in **20** Documents

**Keywords:**

[delocalization](#); [extinction](#); [Fisher equation](#)

**Software:**

[OASIS](#)

**Full Text:** [DOI](#)