

# A population model with small density cut-off

Alexander Lorz

*Laboratoire Jacques-Louis Lions, UPMC Univ Paris 06*

The question of 'cutting the tail' of the solution of an elliptic equation arises naturally in several contexts and leads to a singular perturbation problem with a strong cut-off. We consider both the PDE with a drift and the symmetric case where a variational problem can be stated.

It is known that, in both cases, the same critical scale arises for the size of the singular perturbation. More interesting is that in both cases another critical parameter (of order one) arises that decides when the limiting behaviour is non-degenerate. We study both theoretically and numerically the values of this critical parameter and, in the symmetric case, ask if the variational solution leads to the same value as for the maximal solution of the PDE. Finally we propose a weak formulation of the limiting Bernoulli problem which incorporates both Dirichlet and Neumann boundary condition.

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