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On the interplay of harvesting and various diffusion strategies for spatially heterogeneous populations

We study a Lotka system describing two competing populations, and each of them chooses its diffusion strategy as the tendency to have a distribution proportional to a certain positive prescribed function. For instance, the standard diffusion corresponds to the choice of a uniform distribution. We focused on the interplay of species competition and diffusion strategies with some other factors incorporated: different growth rates, carrying capacities and harvesting. We describe the cases when the choice of diffusion strategies promotes coexistence.

In the case of populations exploitation, the harvesting effort is assumed to be proportional to the space-dependent intrinsic growth rate. The differences between the two populations are the diffusion strategy and the harvesting intensity. In the absence of harvesting, competing populations may either coexist, or one of them may bring the other to extinction. If the latter is the case, introduction of any level of harvesting to the successful species guarantees survival to its non-harvested competitor. In the former case, there is a strip of "close enough" to each other harvesting rates leading to preservation of the original coexistence. Some estimates are obtained for the relation of the harvesting levels providing either coexistence or competitive exclusion.