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SELF-REGULATION IN CONTINUUM POPULATION MODELS

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ABSTRACT

Self-regulation in two models of point entities placed in $\mathbb{R}^d$ is shown to occur under very general assumptions regarding the properties of the models. The first one is an evolving infinite birth-and-death system with dispersal and competition described by the corresponding kernels a^+ and a^-. Assuming that both $a^\pm$ are just continuous and integrable we prove that the evolution of states $\mu_0 \to \mu_t$ preserves their sub-Poissonicity, and hence the local self-regulation (suppression of clustering) takes place. In the second model, we deal with an infinite migration system with the immigration rate b and the competition kernel a^- as in the first model. For this model, we prove that the moments $\mu_t(N_\Lambda^n)$, $n \in \mathbb{N}$, of the number of entities in compact $\Lambda \subset \mathbb{R}^d$ remain bounded for all $t > 0$, and hence the global self-regulation takes place. In both considered models, the self-regulation effects of this kind do not occur if $a^- \equiv 0$.