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Diffusion approximations for one-locus multi-allele kin selection, mutation and random drift in group-structured populations: a unifying approach to selection models in population genetics

Diffusions approximations will be ascertained from a two-time-scale argument in the case of a group-structured diploid population with scaled viability parameters depending on the individual genotype and the group type at a single multi-allelic locus under recurrent mutation, and applied to the case of pairwise interactions within groups. The main step will consist in proving global and uniform convergence of the distribution of the group types in an infinite population in the absence of selection and mutation, using a coalescent approach. The results will show that kin selection can arise from interactions between relatives affecting reproductive success as a result of individual competition or group competition. Inclusive fitness formulations will be ascertained and a connection with the replicator equation in game dynamics will be established.