Genotypic selection in spatially heterogeneous stoichiometric producer-grazer systems

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An understanding of evolutionary dynamics requires a good understanding of genotypic selection. Natural selection can occur when a genotypic variation arises that corresponds to a consistent variation in fitness. Various environmental conditions, such as varying light levels and nutrient loads, may exert selection pressures giving an advantage to a particular genotype. Here we use theoretical approaches to explore the connections between genotypic selection and ecological stoichiometry in spatially heterogeneous environments. We present models of a producer and two grazing genotypes with different stoichiometric phosphorus to carbon ratios under spatially homogeneous and heterogeneous conditions. Numerical experiments predict that selection of a single genotype, co-persistence of both genotypes, and extinction are possible outcomes depending on environmental conditions. Our results indicated that in spatially homogeneous settings, co-persistence of both genotypes can occur when population dynamics oscillate on limit cycles near a key stoichiometric threshold on food quality. Under spatially heterogeneous settings, dynamics are more complex, where co-persistence is observed on limit cycles, as well as stable equilibria.