

# Eco-evolutionary dynamics of intergenomic epistatic QTL under slight and hard multilevel selections in community genetics

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## Abstract

Eco-evolutionary community genetics refers to study population genetics at multispecies levels since a single species evolves genetically through interactions with other species. The aim of this paper is dynamical modeling of interspecific quantitative trait loci (QTL) under slight and hard multilevel selection to investigate eco-evolutionary genetic relationships among QTL of multispecies. It was found that the simplex explained the intergenomic epistatic QTL (IEQ) dynamics in a discrete-time model according to Wright's manifold. Besides, the generalized gradient system on the simplex demonstrated the IEQ dynamics in a continuous-time model. The outcomes of slight and hard multilevel selection on the expressions of IEQ in species were explained by the gradient operator of the mean multilevel fitness. IEQ analysis was integrated into community genetics according to Lande's assumptions, so for slight multilevel selection the geometric average of the mean multilevel fitness specified Wright's idea of adaptive topography. The dynamical system for phenotypic eco-evolution under hard multilevel selection gradient was studied and the relative mean multilevel fitness of two selected species was estimated.

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