Structured coalescent with nonconservative migration

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Abstract. The n-coalescent or simply the coalescent, also called Kingman's coalescent, is a continuous-time Markov process that describes the ancestry of a sample of n individuals or genes in a large population. It plays an important role in population genetics. It has been extended to include such biological phenomena as mutation, recombination, selection, populations with a mixture of self-fertilization and random mating, models with variable population size for single populations.

The coalescent has then been extended to subdivided population models and geographically structured models which required an approximation by the structured coalescent, a generalization of Kingman's coalescent. Many population structure models have been shown to converge to the structured coalescent.

The coalescent is used to explore the genealogy of a sample of individuals from a sufficiently large population, starting from a particular time (called time 0) and going backward in time until the first common ancestor (most recent common ancestor) of the sample is reached. It serves as a continuous-time approximation for the ancestral structure of a variety of discrete-time population models. A discrete-time ancestral process is a population model that counts the number of ancestral lineages of the original sample in each generation in the past. The basic idea is that the population size is fixed at N. Then, when time is measured in units of N generations, the discrete-time process converges to the coalescent as N tends to infinity. This idea is generalized to structured populations.

In this talk, I present a subdivided population model with stochastically varying population size and nonconservative migration. Nonconservative migration means that the number of lineages migrating out of a subpopulation is not equal to the number of lineages migrating in that subpopulation. I then show that, when the total population size tends to infinity, the structured coalescent is obtained, thus confirming the robustness of the coalescent.