



Mathematical Statistics  
Stockholm University  
Research Report **2011:2**,  
<http://www.math.su.se/matstat>

# Coalescence Theory for a General Class of Structured Populations with Fast Migration

Ola Hössjer

March 15, 2011

## Abstract

A general class of population genetic models is studied where the total population is divided into a number of subpopulations or types. Migration between subpopulations is fast. Extending results of Nordborg and Krone (2002) and Sagitov and Jagers (2005), we prove, as the total population size  $N$  tends to infinity, weak convergence of the joint ancestry of a given sample of haploid individuals in the Skorohod topology towards Kingman's coalescent with constant change of time scale  $c$ . Our framework includes age-structured models, geographically structured models and combinations thereof. We also allow each individual to have offspring in several subpopulations, with general dependency structures between the number of offspring of various types. As a by-product, very explicit expressions for the coalescent effective population size  $N/c$  are obtained.

**Key words:** Age-structured populations, coalescent theory, effective population size, geographical substructure, weak convergence.

**2010 Mathematics Subject Classification:** Primary 92D25, secondary 60J28, 60F17.