

Ecological Genetics – HS18

v0.1

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Vorwort

This document aims to summarize the lecture Ecological Genetics as it was taught in the autumn semester of 2018. Unfortunately I can't guarantee that it is complete and free of errors. You can contact me under glebert@student.ethz.ch if you have any suggestions for improvement. The newest version of this summary can always be found here: <https://n.ethz.ch/~glebert/>

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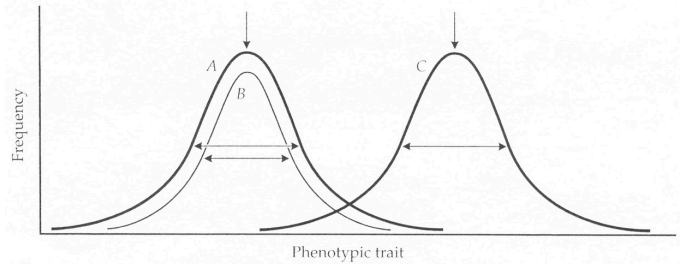
1 Introduction

“Nothing in biology makes sense except in the light of evolution”

— Theodosius Dobzhansky

In 1971 Ford wrote that ecological genetics deal with the adjustments and adaptations of wild populations to their environment. According to Conner and Hartl (2004) ecological genetics is the study of the process of phenotypic evolution occurring in present-day natural populations and is concerned with the genetics of ecologically important traits, that is, those traits related to fitness.

Phenotypic evolution is the change in the mean or variance of a trait across generations due to changes in allele frequencies.



Ecologically important traits are closely tied to fitness and are important in determining an organisms adaptation to its natural environment. **Adaptation** is a heritable phenotypic trait that has evolved in a population in response to a specific environmental factor and improves the survival or reproduction of its carriers. It can also be seen as a process whereby the members of a population become better suited to some feature of their environment through change in a characteristic that affects their survival or reproduction. Of the four key evolutionary processes, only natural selection consistently leads to adaptation (mutations, genetic drift and gene flow don't).

Uses of ecological genetics include

- agriculture (crop improvement)
- medicine (e.g. antibiotics)
- conservation measures (assisted migration)
- geographical differences between populations
- changes in species composition
- habitat adaptation & speciation

Fields related to ecological genetics include

- population genetics
- ecology
- evolutionary biology
- phylogenetics
- quantitative genetics
- statistics
- molecular biology
- epigenetics
- genomics