

Lecture 2: The Nature of Adaptation

Outline

- Rationale
- Concepts and definitions
- Adaptation at the individual level
- Adaptation at the population level

I. Rationale

A. Understanding adaptation is fundamental to understanding fish ecology. Why?

B. Two types of adaptations

II. Some concepts and definitions

A. The name of the game

1. Individuals: fitness

2. Populations: persistence

B. Selection pressures (A.K.A. selective forces, agents of natural selection)

C. Adaptation

D. Genotype

E. Phenotype

II. Adaptation of individuals

A. Limits and loopholes in individual adaptation

B. Some types of individual adaptations

1. Morphological

2. Behavioral

3. Physiological

C. How does the adaptive response work?

1. The effector-receptor-transmitter-effector-output system

2. Examples

D. Strategies of physiological adaptation

1. Regulators

a. Pros and cons

b. Example: osmosis in sharks

2. Conformers

a. Pros and cons

b. Example: osmosis in bony fish

E. Acclimation

III. Adaptation of populations

A. Populations adapt by producing different phenotypes, via changes in the gene pool

B. Sources of change in the gene pool (population genetics 101)

1. Mutation

2. Drift

3. Migration

4. Selection

C. Partitioning of genetic diversity

D. Strategies for apportioning genetic diversity

1. Type I: high genotypic diversity, low phenotypic plasticity

2. Type II: low genotypic diversity, high phenotypic plasticity

IV. The Coho salmon example

V. Conclusions

A. Adaptation vs. adaptationism

1. Convergence and homology

2. Evolutionary tradeoffs

B. Interactions between individual and population adaptation – not always a win-win

C. The speed of adaptation

1. Individual vs. population

2. Limits