

Sympatric Speciation in African Cichlids

- Studied fish species in two lakes
 - Species in each lake are most likely descended from single ancestor
- No barriers within either lake
- Some ecological separation but species in each lake breed in sympatry

Speciation by Polyploidy

- Change in chromosome number
($3n$, $4n$, etc.)
- Offspring with altered chromosome number cannot breed with parent population
- Common mechanism of speciation in flowering plants

Possible Evolution of Wheat

Sympatric speciation in wheat

Parapatric Speciation

Adjacent populations evolve into distinct species while maintaining contact along a common border

Section 19.4: Weblinks and InfoTrac

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Videos: CNN

Ask your Thomson Sales Representative for these volumes on CD or VHS

- Biology, 2004, Vol. 8, *Lizard Diversity* (1:33)

Patterns of Change

in a Lineage

- Cladogenesis
 - Branching pattern
 - Lineage splits, isolated populations diverge
- Anagenesis
 - No branching
 - Changes occur within single lineage
 - Gene flow throughout process

Evolutionary Trees

Evolutionary Trees

Evolutionary tree diagram

Evolutionary Trees

Evolutionary tree for plants

Gradual Model

- Speciation model in which species emerge through many small morphological changes that accumulate over a long time period
- Fits well with evidence from certain lineages in fossil record

Punctuation Model

- Speciation model in which most changes in morphology are compressed into brief period near onset of divergence
- Supported by fossil evidence in some lineages

Adaptive Radiation

- Burst of divergence
- Single lineage gives rise to many new species
- New species fill vacant adaptive zone
- Adaptive zone is “way of life”

Extinction

- Irrevocable loss of a species
- Mass extinctions have played a major role in evolutionary history
- Fossil record shows 20 or more large-scale extinctions
- Reduced diversity is followed by adaptive radiation

Who Survives?

- Species survival is to some extent random
- Asteroids have repeatedly struck Earth, destroying many lineages
- Changes in global temperature favor lineages that are widely distributed

Section 19.5: Weblinks and InfoTrac

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Taxonomy

- Field of biology concerned with identifying, naming, and classifying species
- Somewhat subjective
- Information about species can be interpreted differently

Binomial System

- Devised by Carl von Linne
- Each species has a two-part Latin name
- First part is generic
- Second part is specific name

Higher Taxa

- Kingdom
- Phylum
- Class
- Order
- Family

Phylogeny

- The scientific study of evolutionary relationships among species
- Practical applications
 - Allows predictions about the needs or weaknesses of one species on the basis of its known relationship to another

A Cladogram

Five-Kingdom Scheme

- Proposed in 1969 by Robert Whittaker

Three-Domain Classification

- Favored by microbiologists

Six-Kingdom Scheme

Six-Kingdom Scheme

Classification systems

Evolutionary Tree

Section 19.6: Weblinks and InfoTrac

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Constructing

A

Cladogram

Constructing a Cladogram

A Cladogram

Constructing a Cladogram

A Cladogram

Interpreting a Cladogram

Section 19.7: Weblinks and InfoTrac

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Evolutionary Tree

Evolutionary Tree

Current evolutionary tree

Section 19.8: Weblinks and InfoTrac

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We're All Related

- All species are related by descent
- Share genetic connections that extend back in time to the prototypical cell

We're All Related
We're All Related