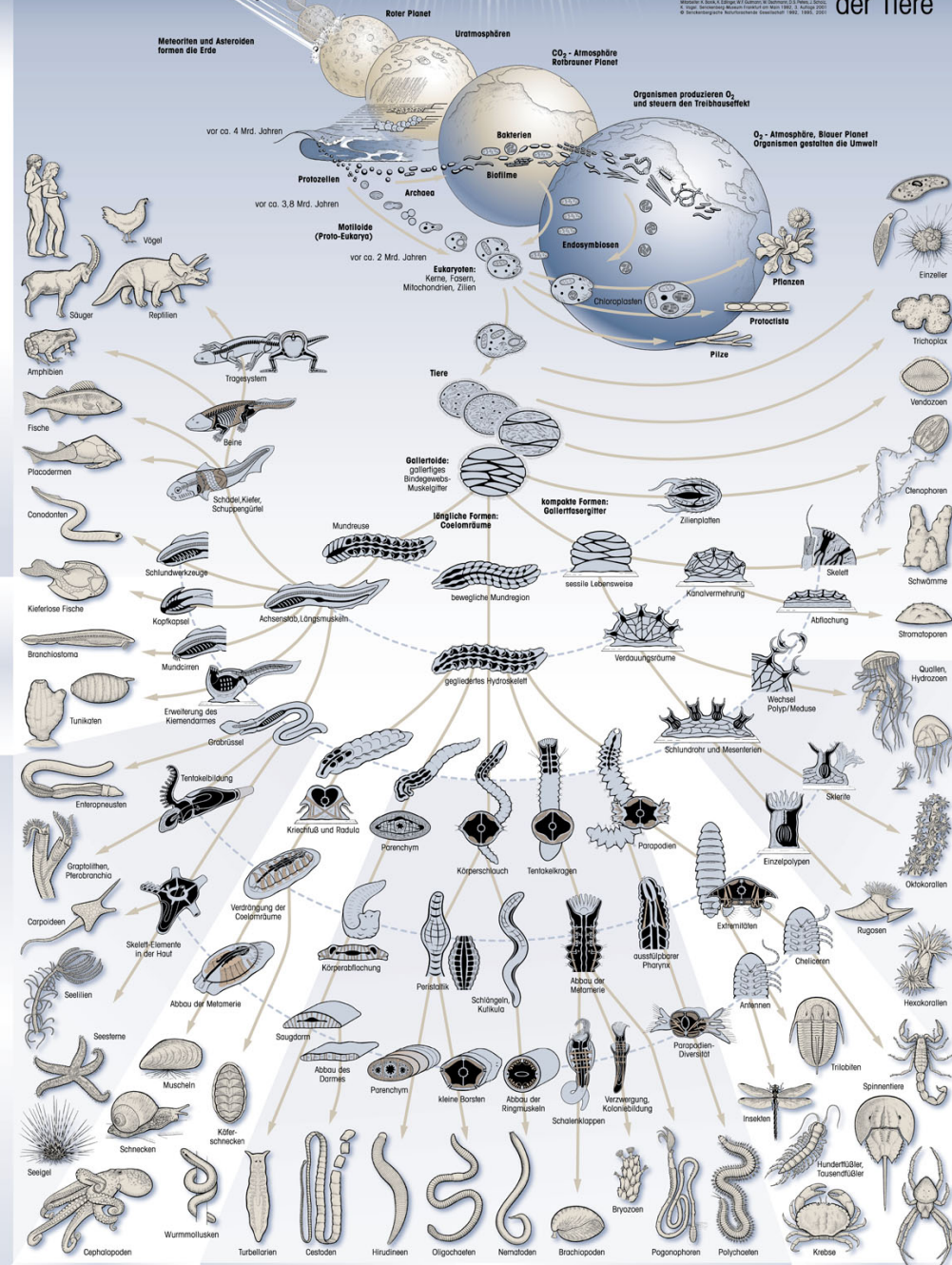


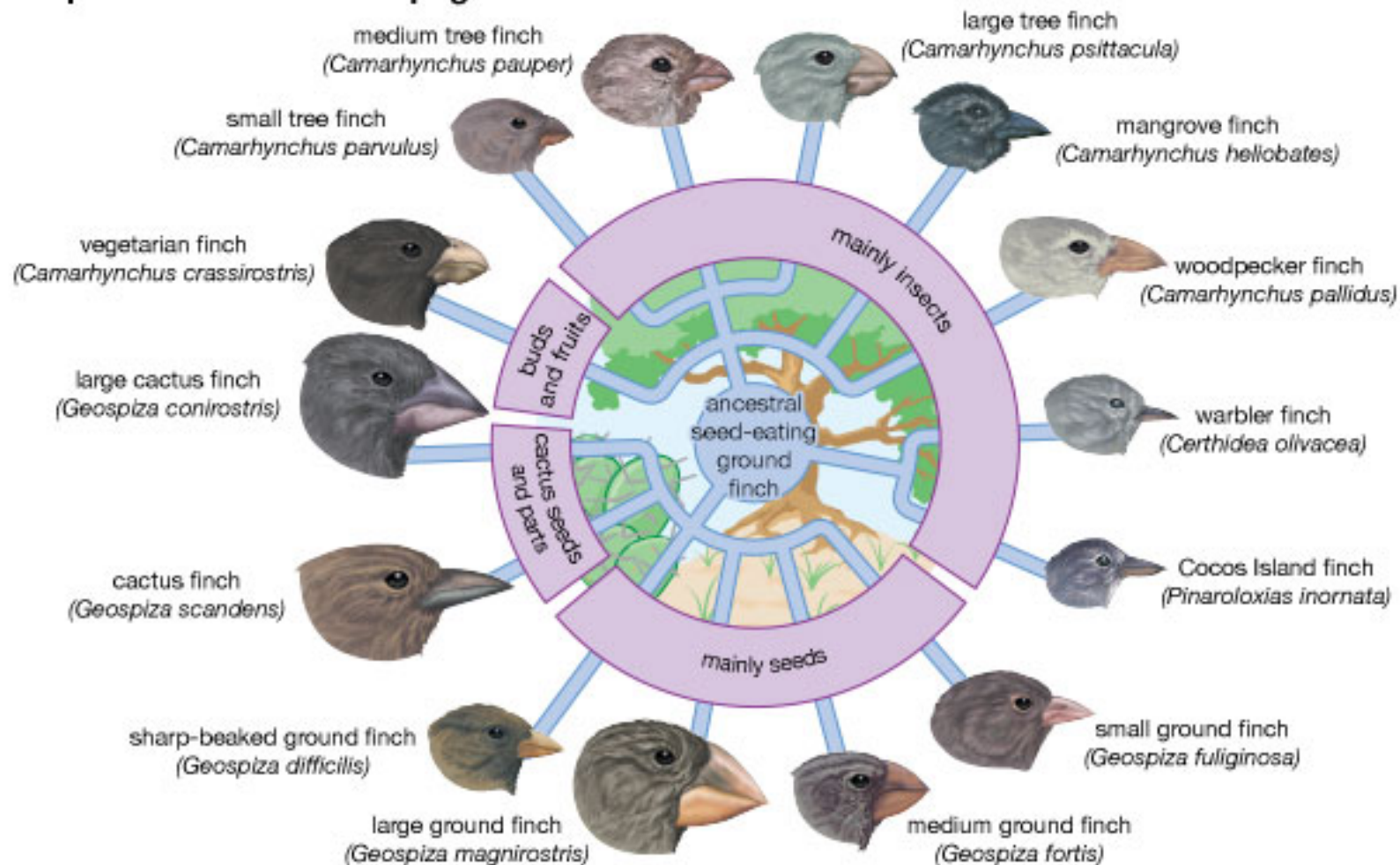
Evolução Especiação

David De Jong
Depto. de Genética
FMRP-USP

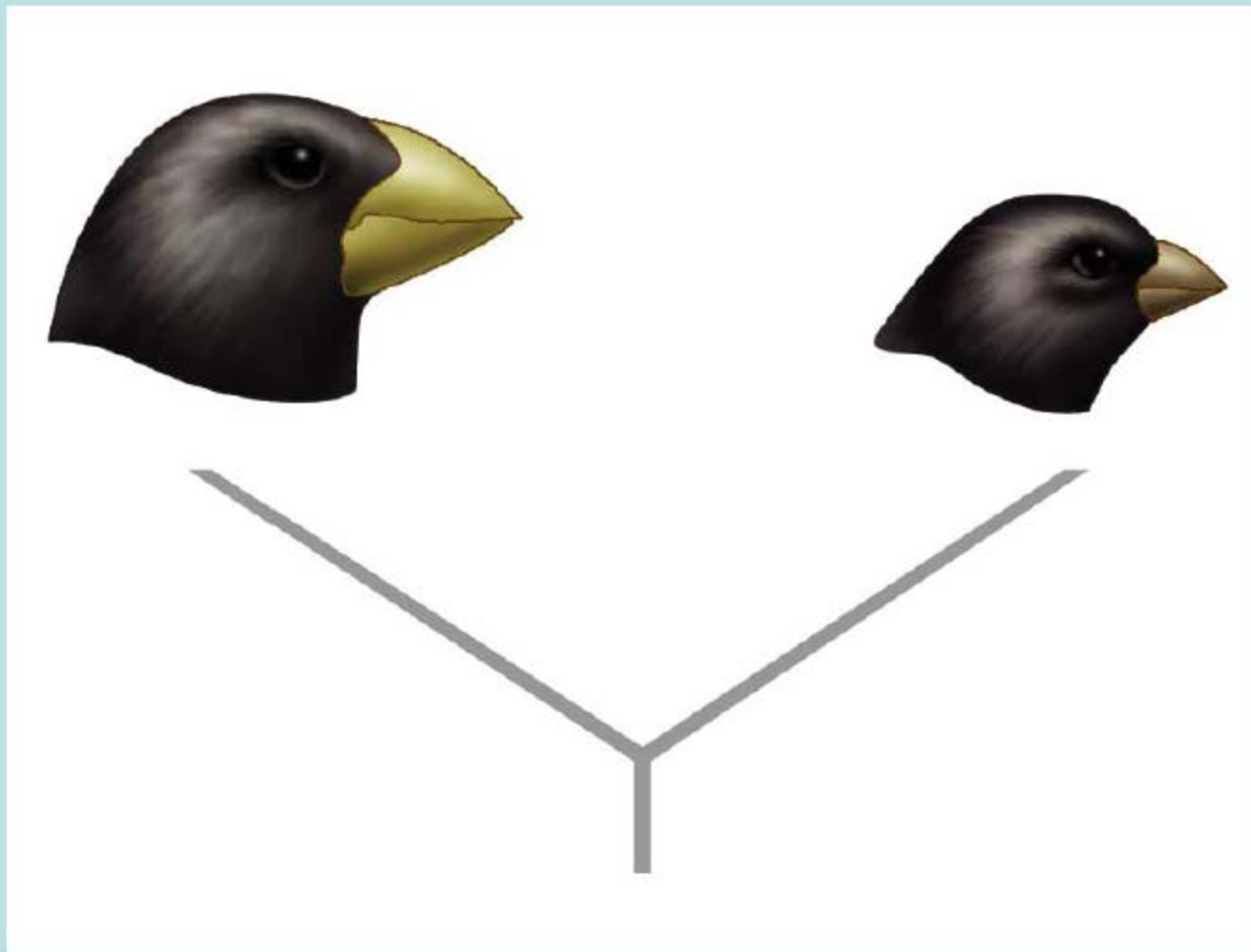
Die Evolution der Tiere



Adaptive radiation in Galapagos finches



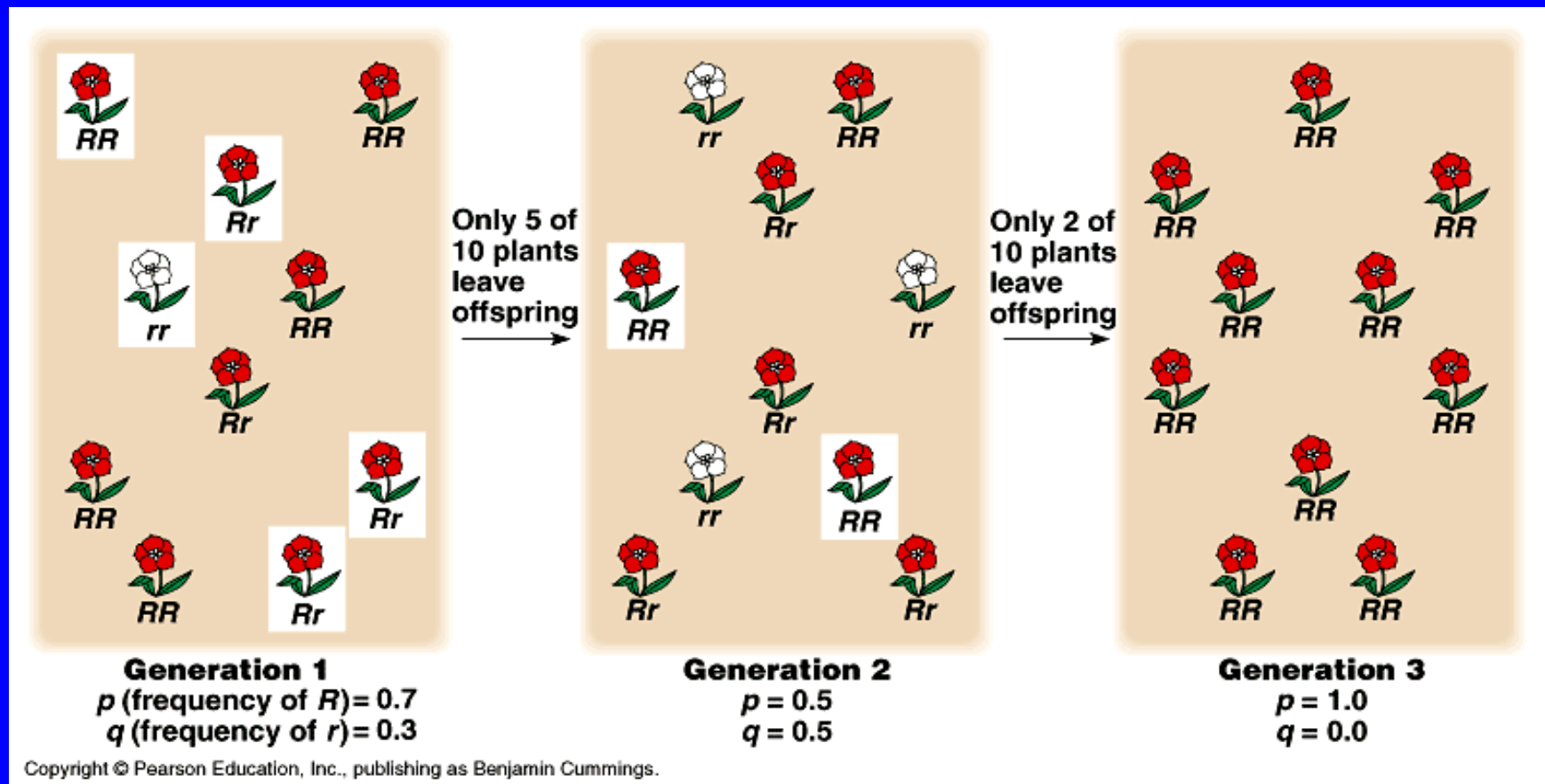
Especiaçãoção



Espécie ancestral

Deriva genética muda populações.....

- Mudança aleatória em frequência do alelo pode tornar um alelo comum



Mecanismos de aislamiento

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Reproductive Isolating Mechanisms

Mechanism

Description

Prezygotic Isolating Mechanisms

Geographic isolation



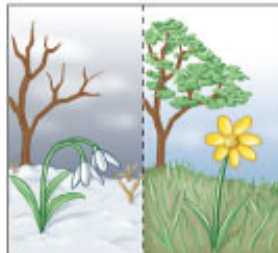
Species occur in different areas, which are often separated by a physical barrier such as a river or mountain range.

Ecological isolation

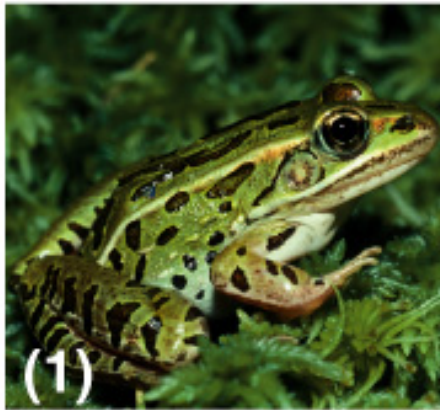


Species occur in the same area, but they occupy different habitats and rarely encounter each other.

Temporal isolation



Species reproduce in different seasons or at different times of the day.



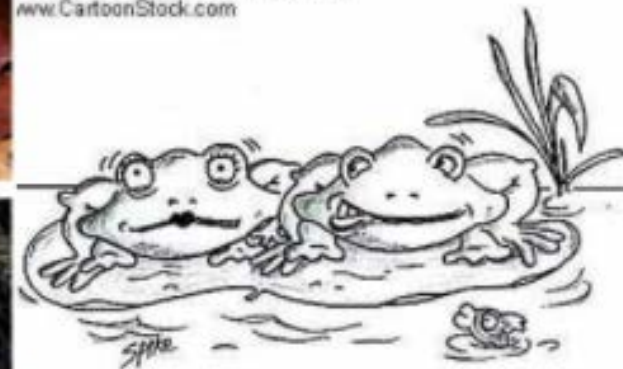
Genetic Variation

• 2. Isolation Mechanisms

Behavioral Isolation – do not mate because of incorrect behavior cues – displays, courting rituals, songs, etc.



Original Artist
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"Fancy coming back to my pad?"

4 leopard frog species overlap habitat but have different mating calls

(A)



Allopatric
P. feriarum



Sympatric
populations



Allopatric
P. nigrita



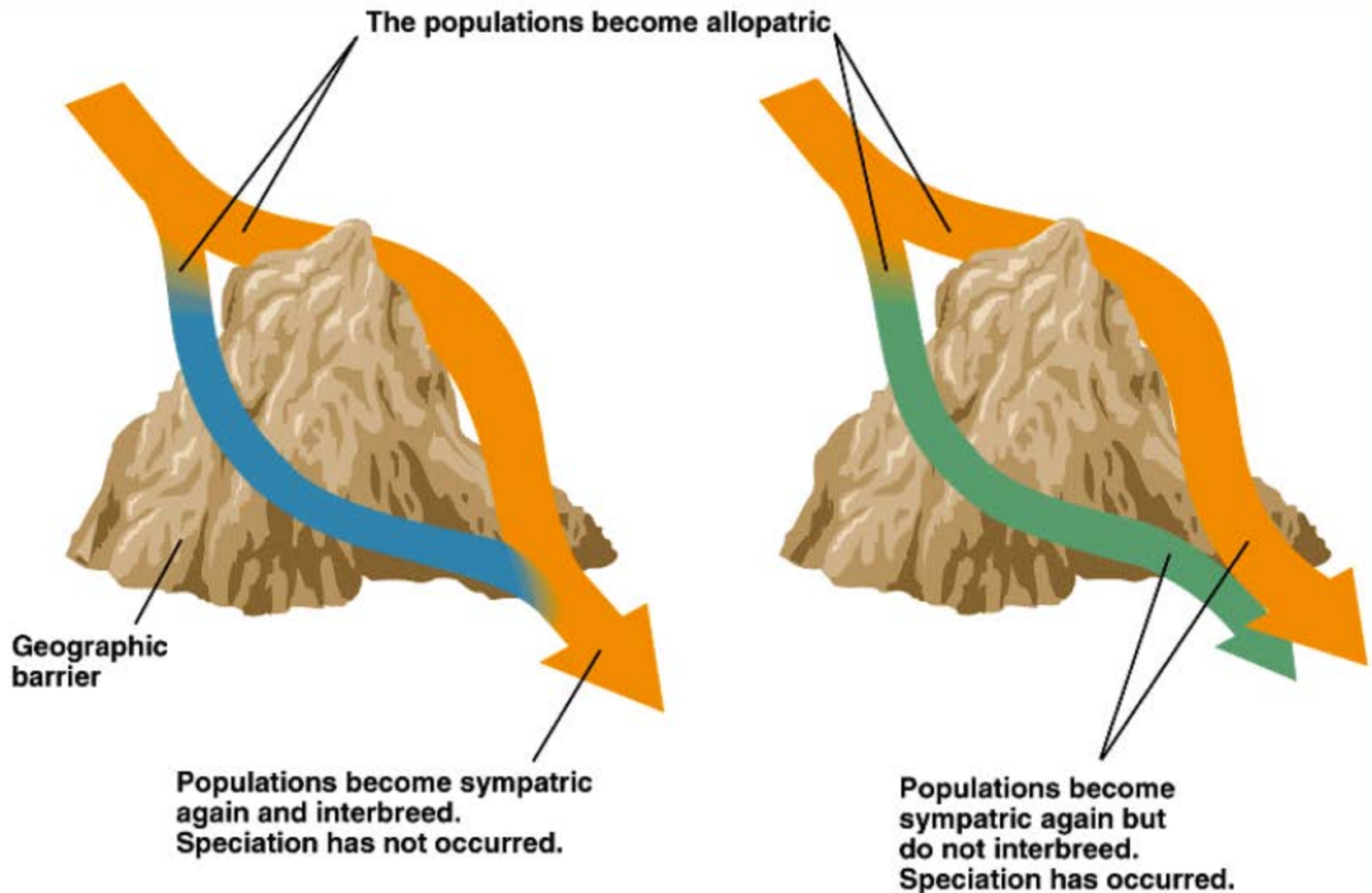
P. nigrita

F₁ hybrid

P. feriarum

Acoustic signals

Especiação alopátrica

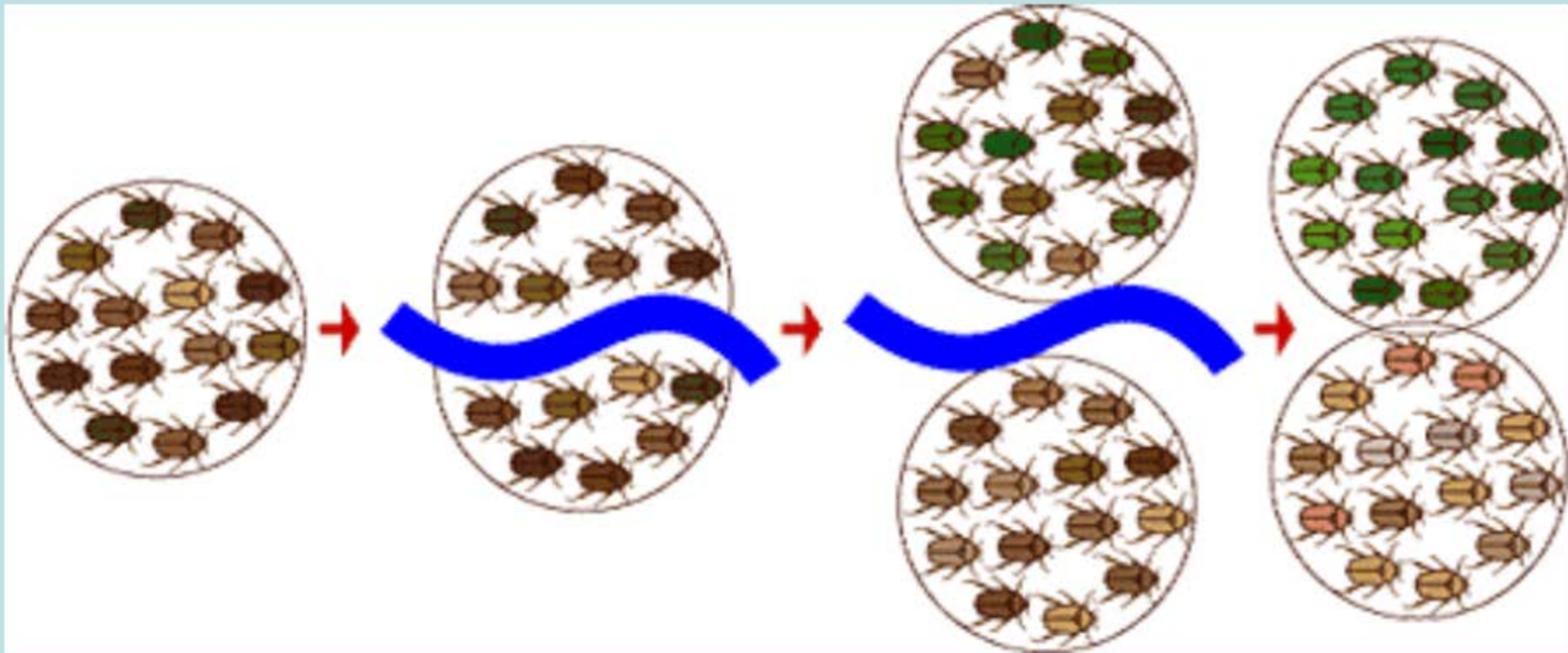


Esquilos separados pelo Grand Canyon

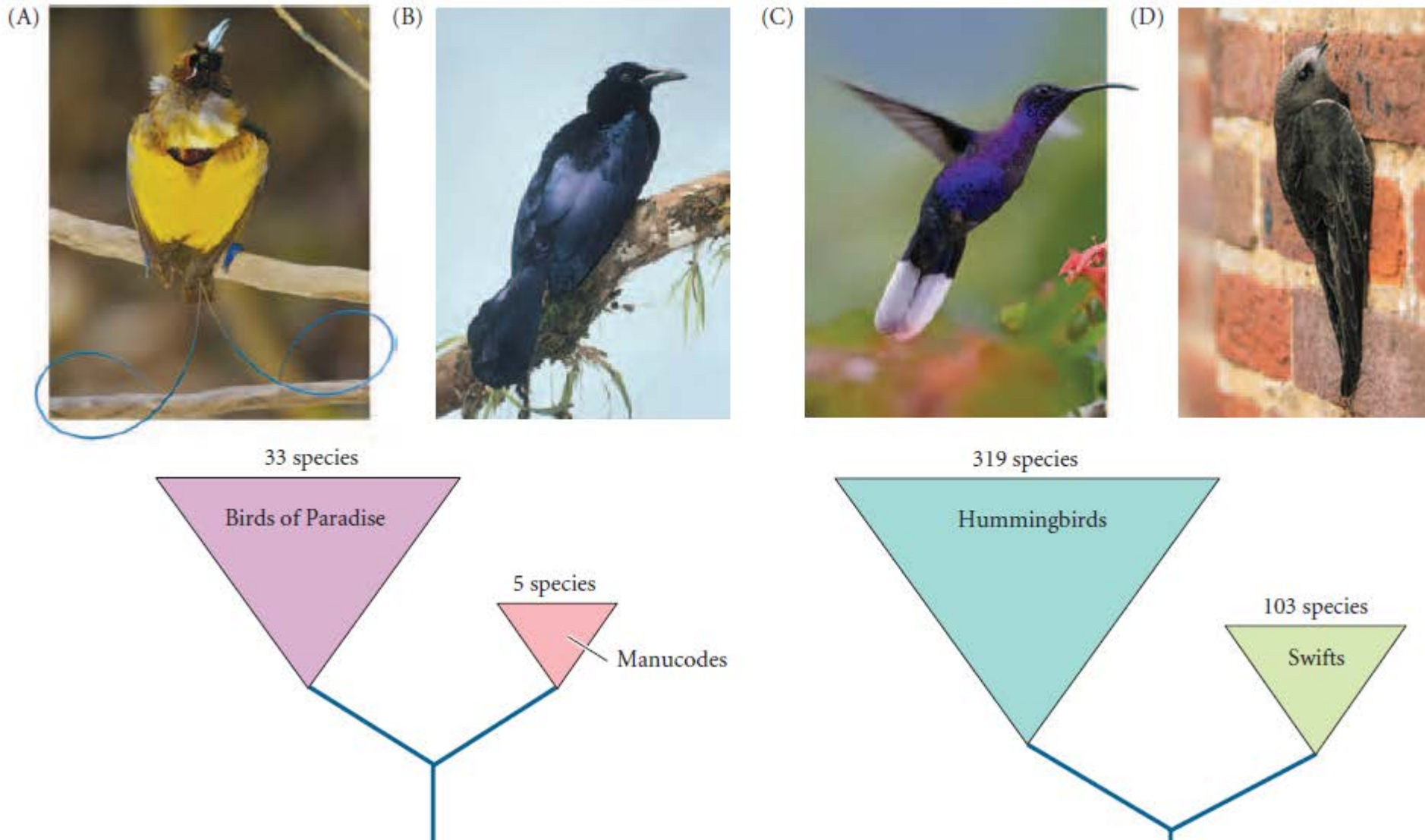


Diferenciação entre populações

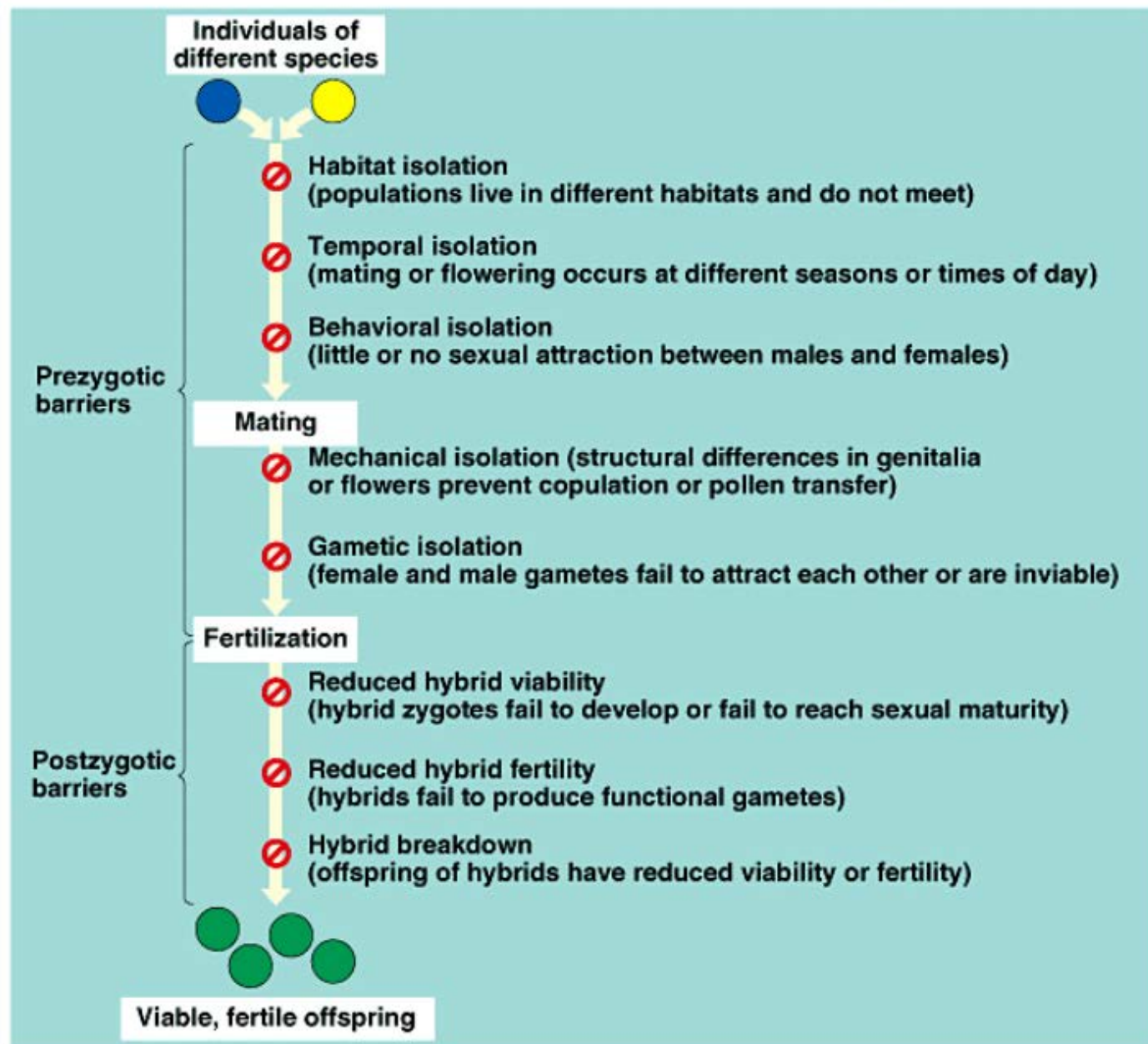
Especiação: resultado de acúmulo de diferenças genéticas entre populações isoladas



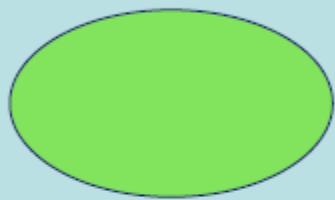
Seleção sexual em grupos relacionados (promíscuos vs. monogamia)



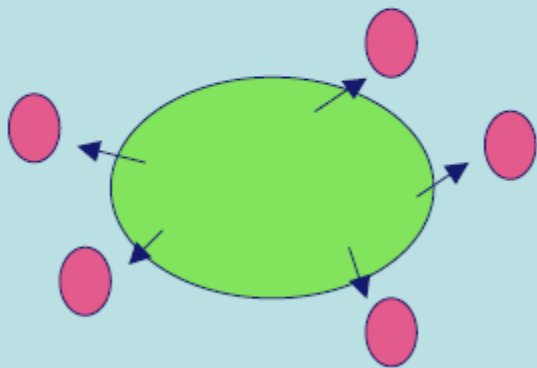
Mecanismos de aislamiento reproductivo



Modos de especiação classificados por geografia



Alopatria

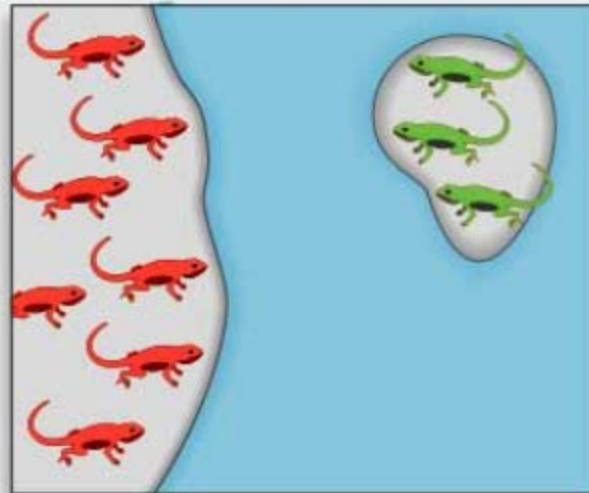
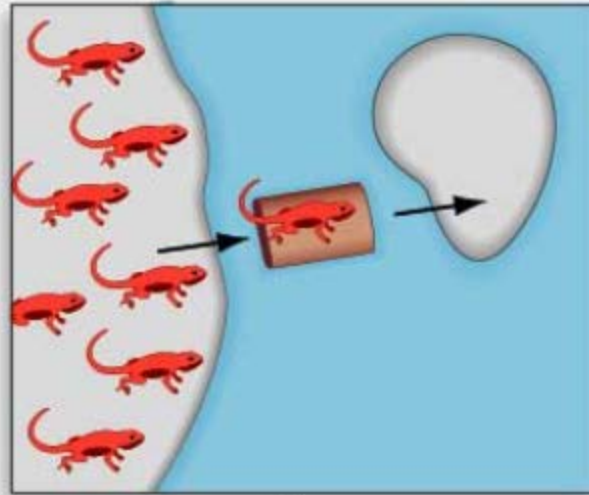


Peripatria

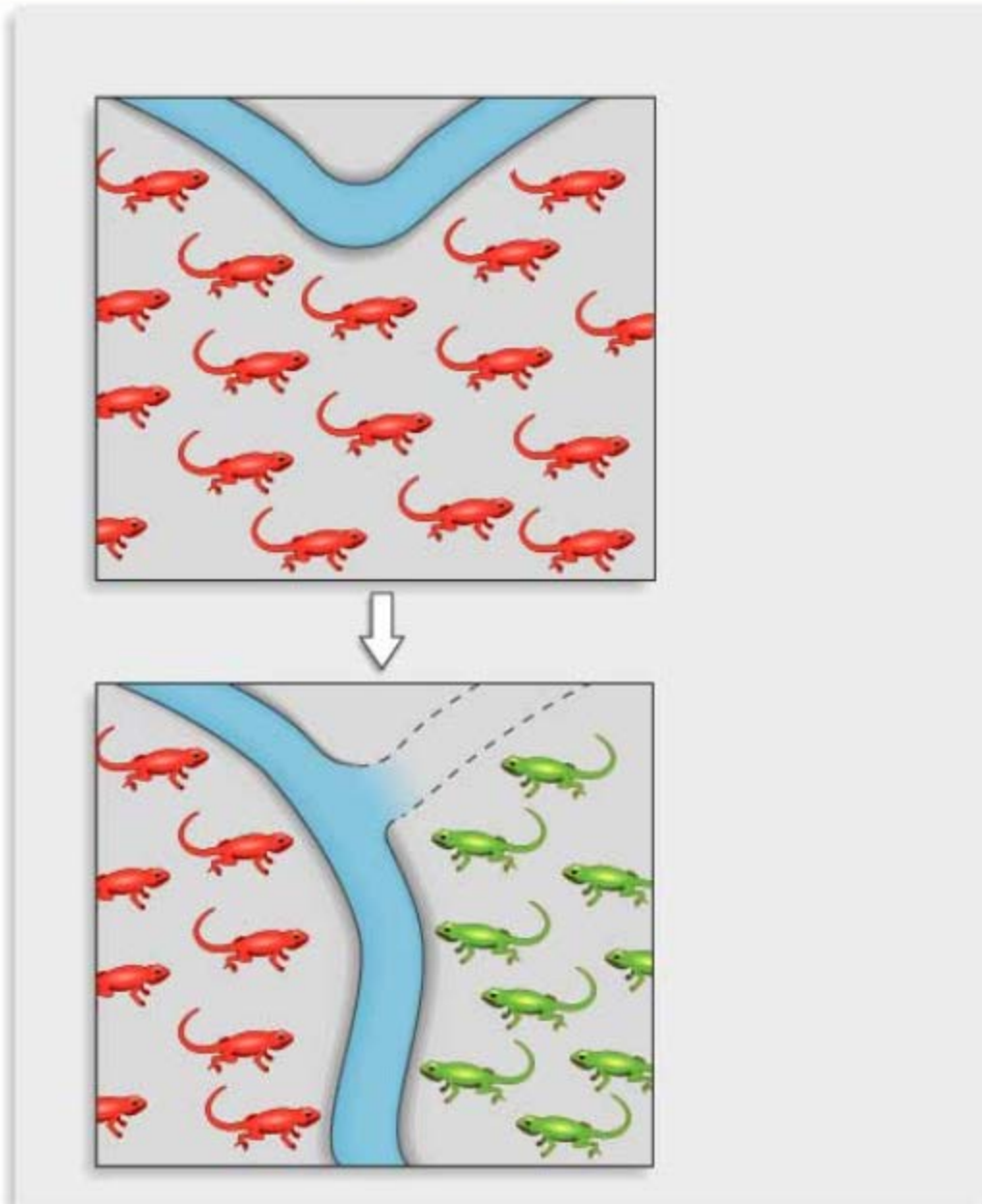


Parapatria

Especiação alopátrica por dispersão



Especiação alopátrica por vicariância



Peripatria Kingfishers



T. carolinae



T. riedelli



T. galatea

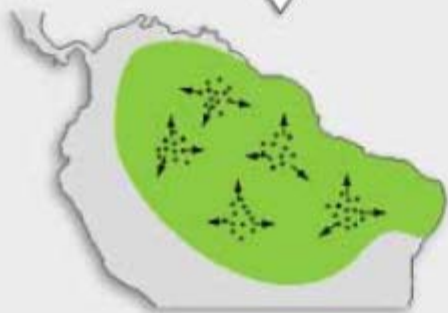
Hipótese dos refúgios



Clima úmido

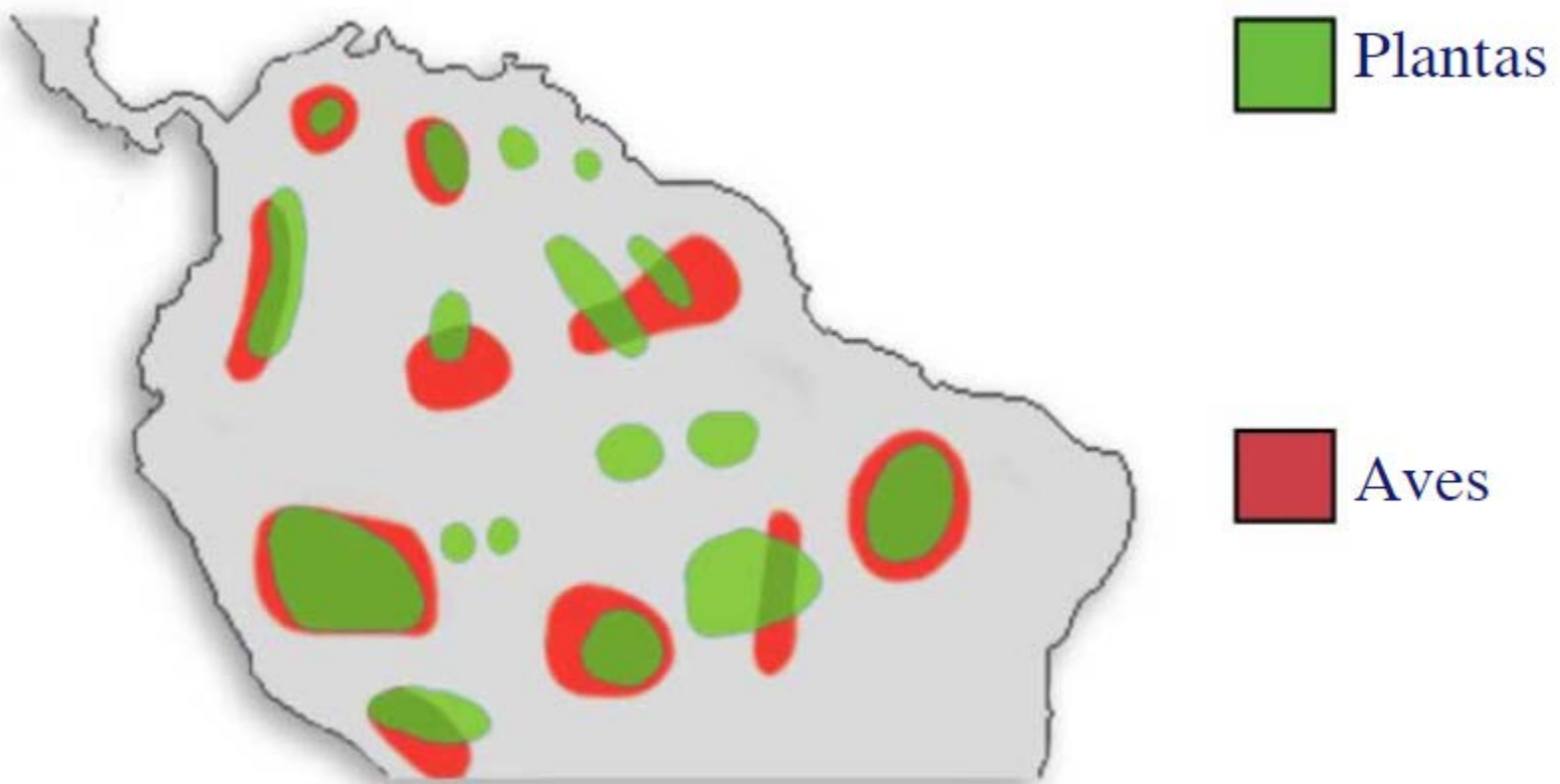


Clima seco



Clima úmido

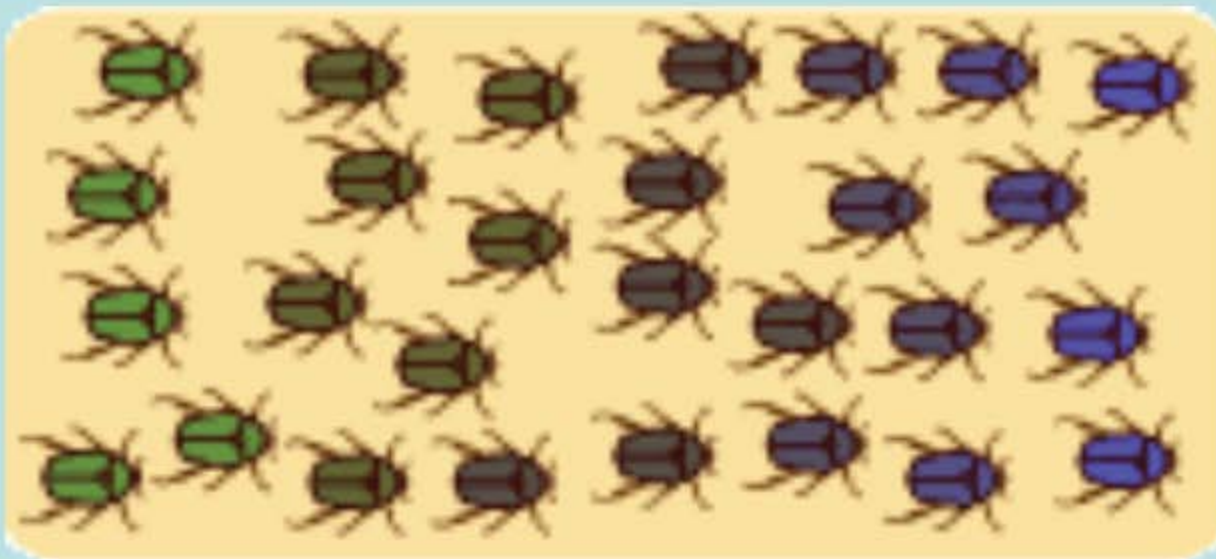
Hipótese dos refúgios: dados que apoiam



Especiaçãoção parapátrica



**Gradiente
ambiental**



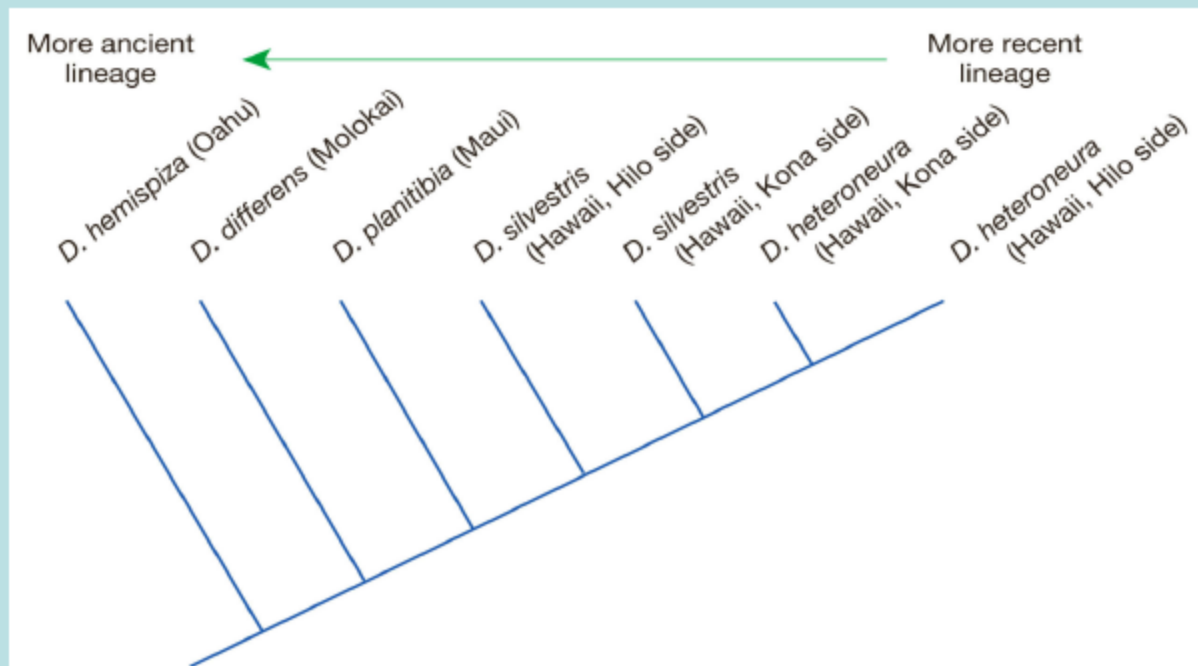
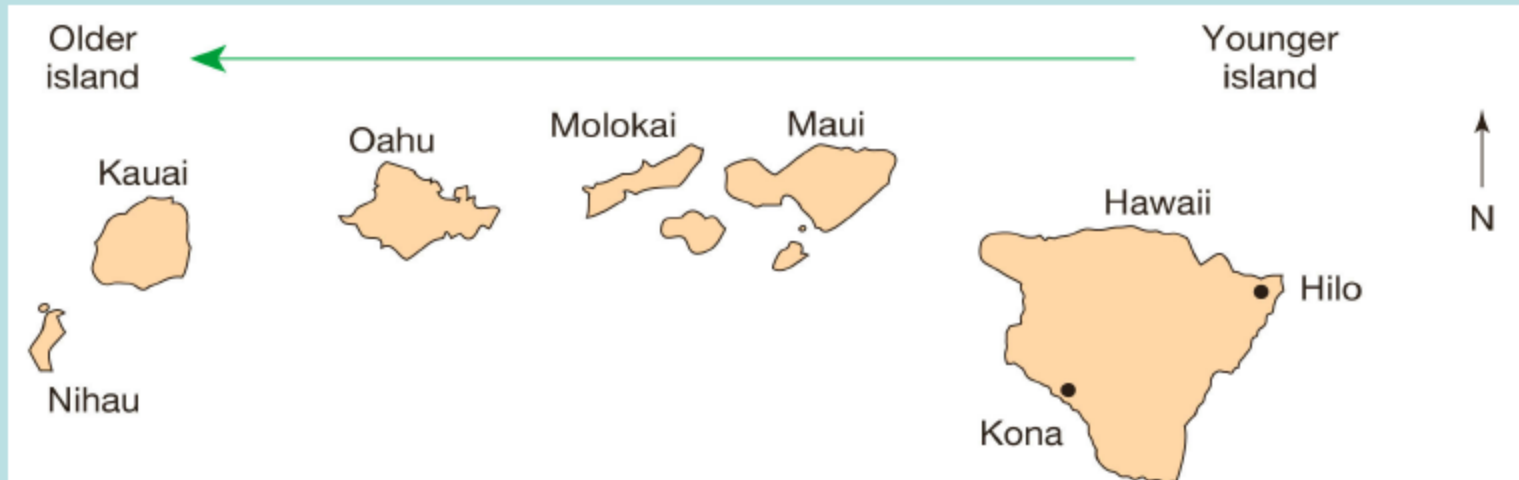
**Gradiente
genético**

Hawaii: História geológica do arquipélago



- Ponto quente move-se em relação à placa tectônica
- Vulcões emergem e depois são erodidos

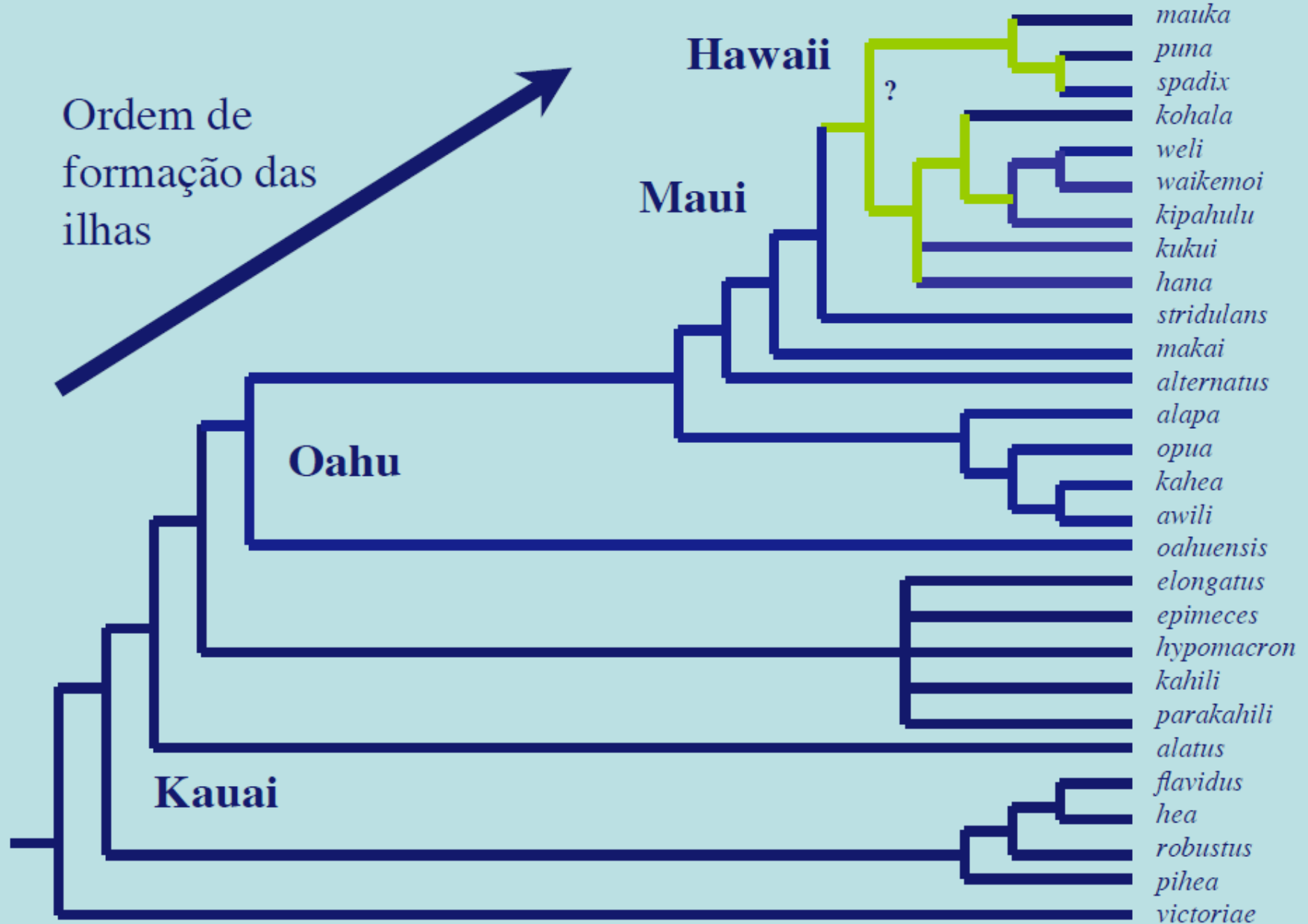
Hawaii: História das ilhas e das espécies de *Drosophila*



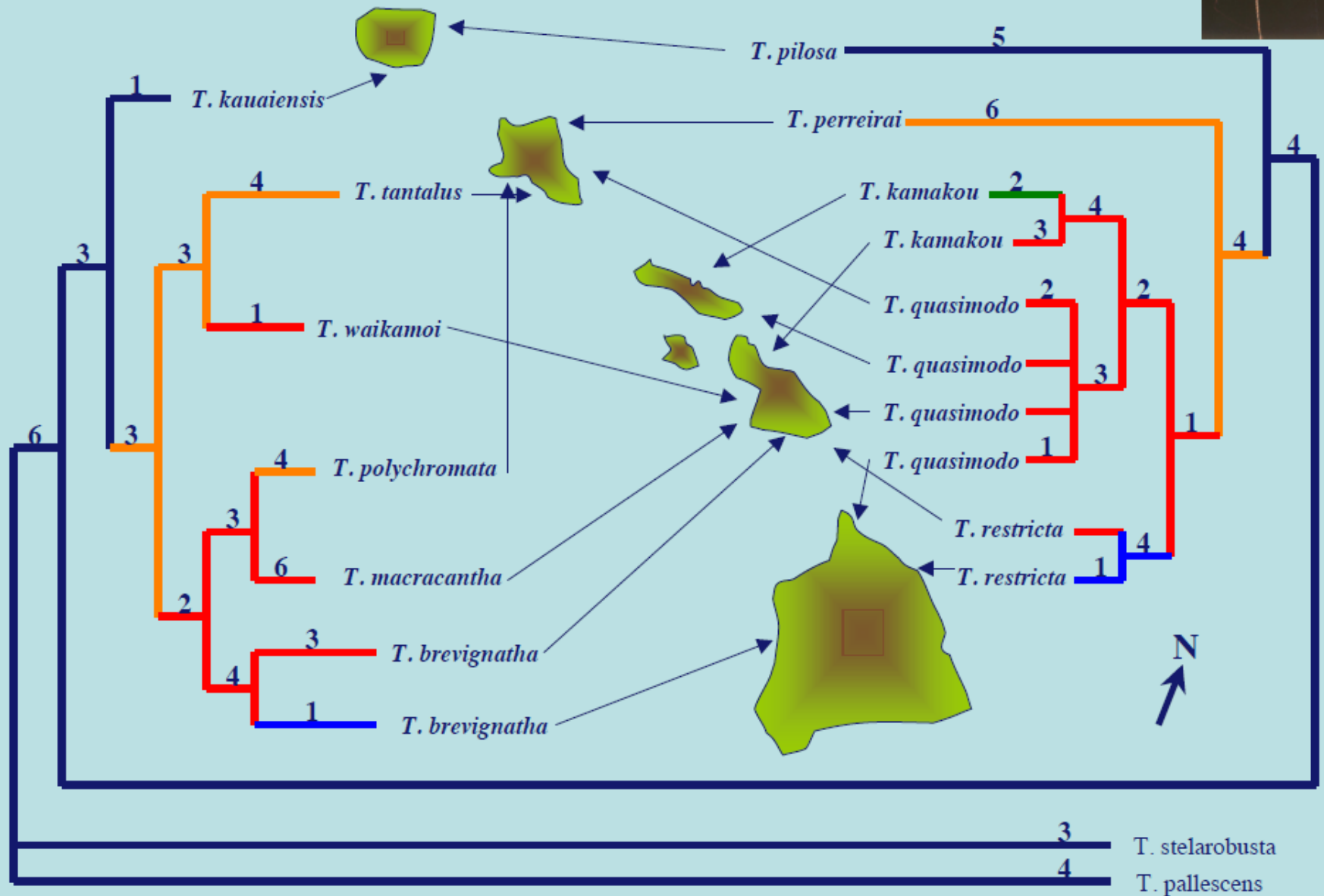
Grilos do Hawaii

Prognathogryllus

Ordem de
formação das
ilhas



Aranhas do gênero *Tetragnatha*

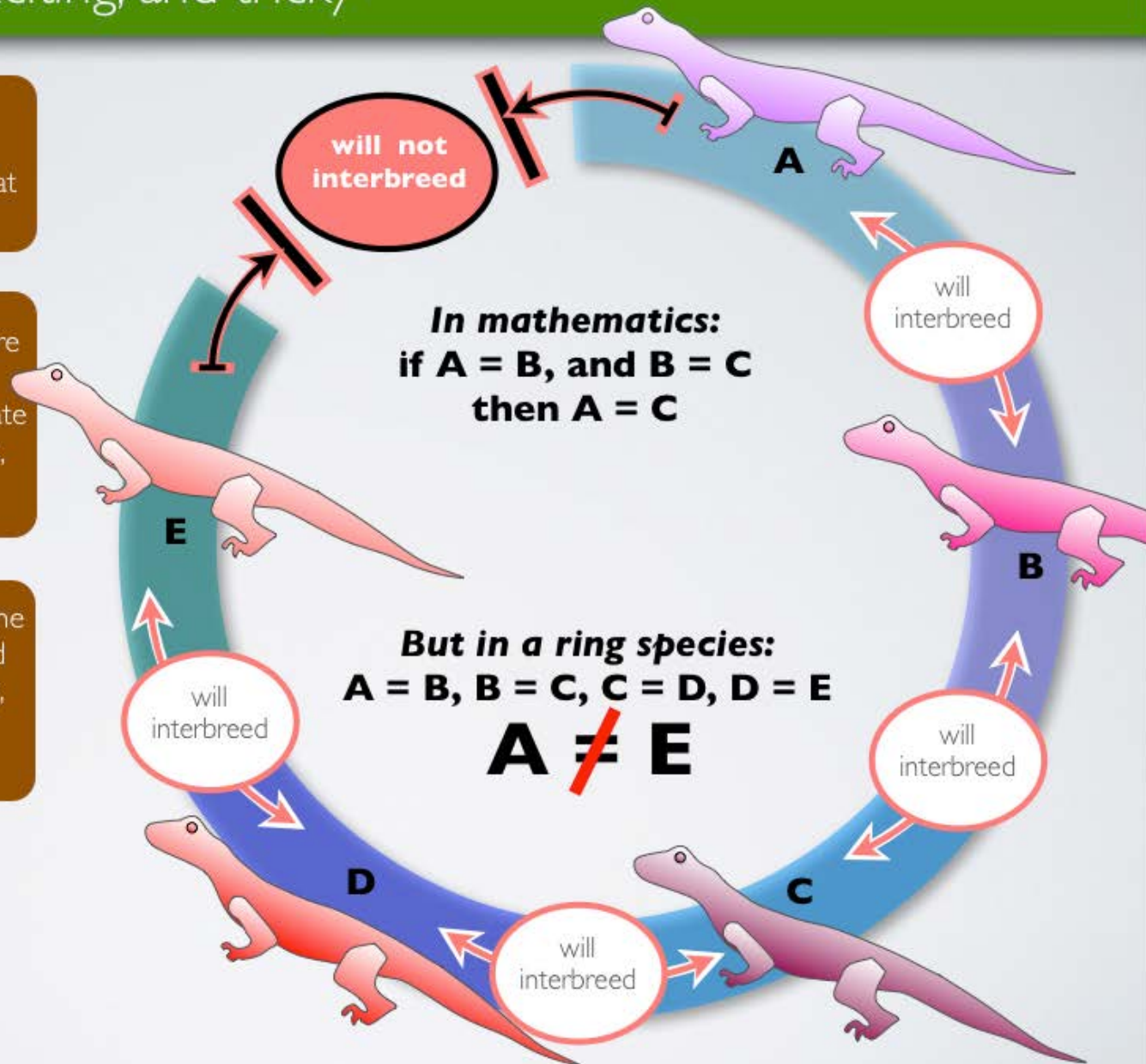


Ring species: exciting, and tricky

A ring species is a series of **geographically neighboring** populations that are closely related.

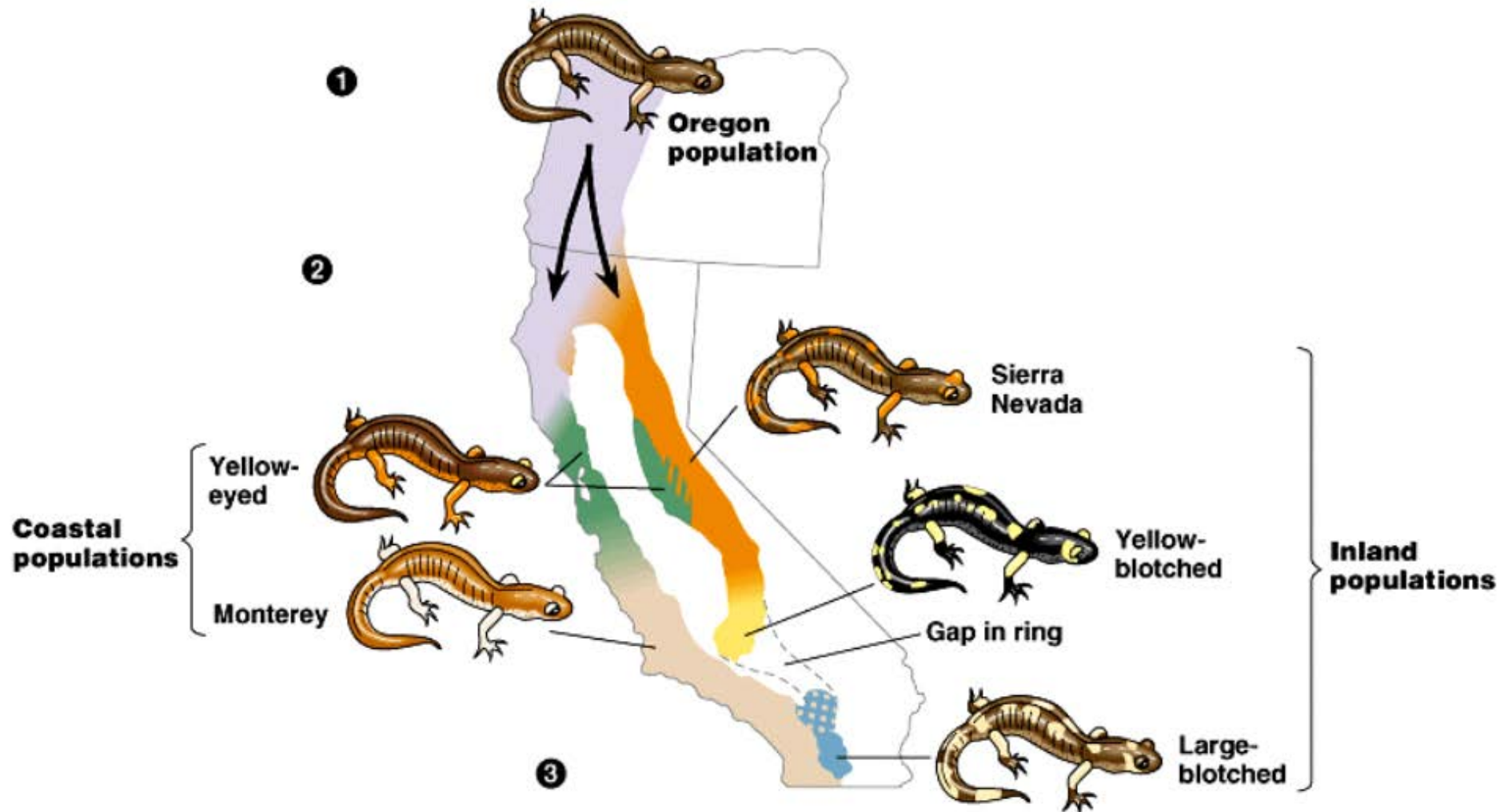
Members of adjacent groups are related so closely that they **interbreed**. This would indicate they are the **same species**, despite some differences.

Members of populations near the "ends" of the territorial spread are incapable of interbreeding, **indicating separate species**.



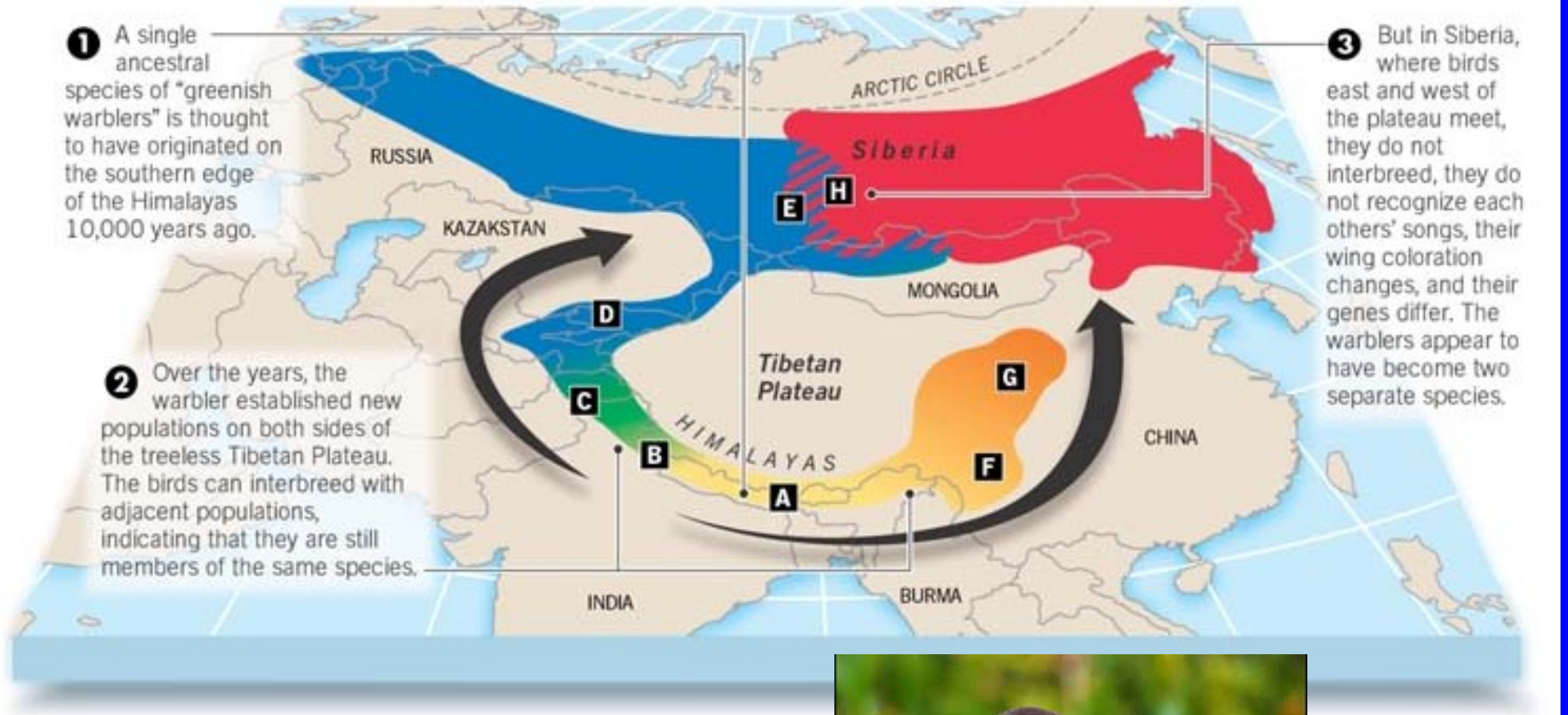
Distribuição em anel

Ring species



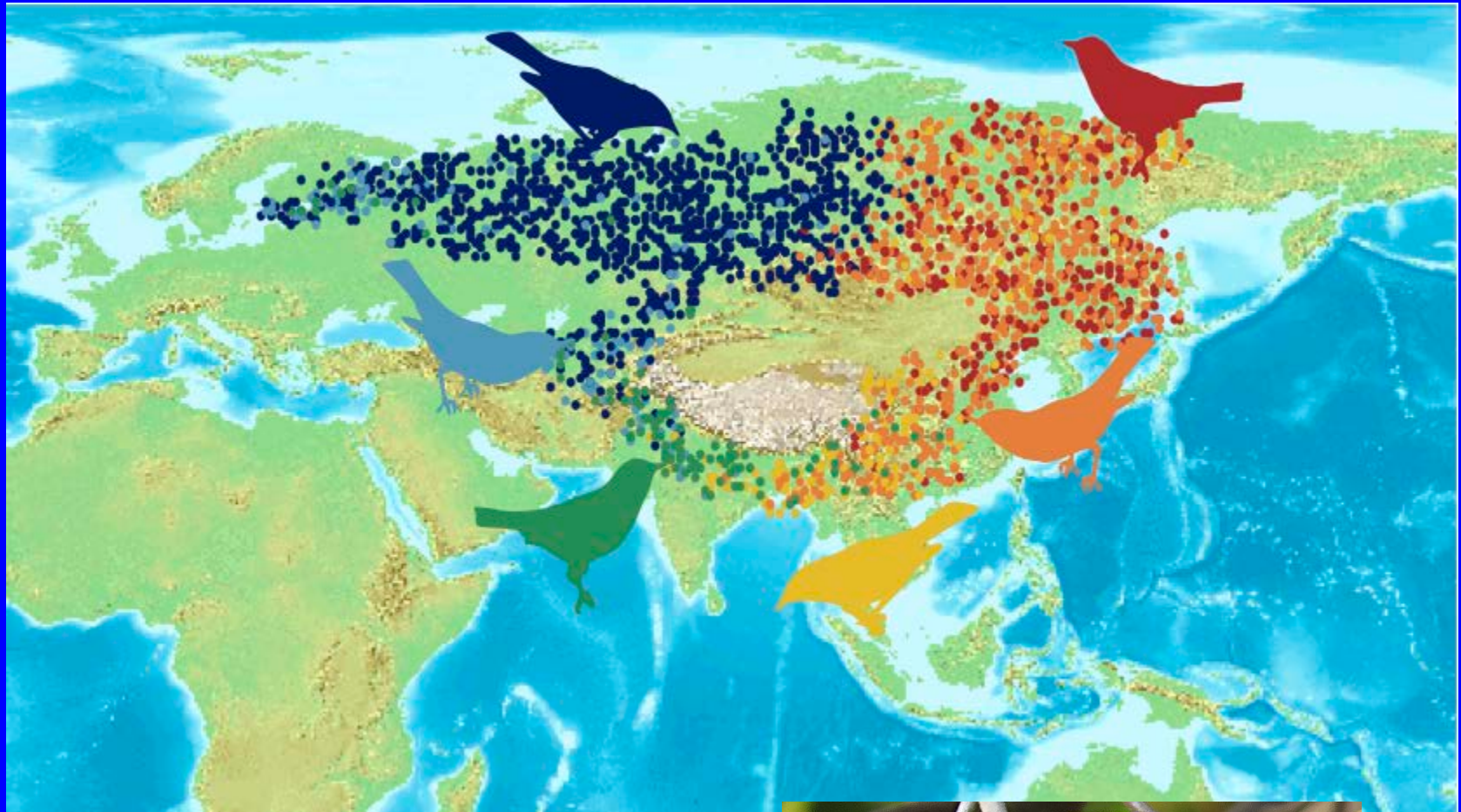
Tracing the Evolution of Species

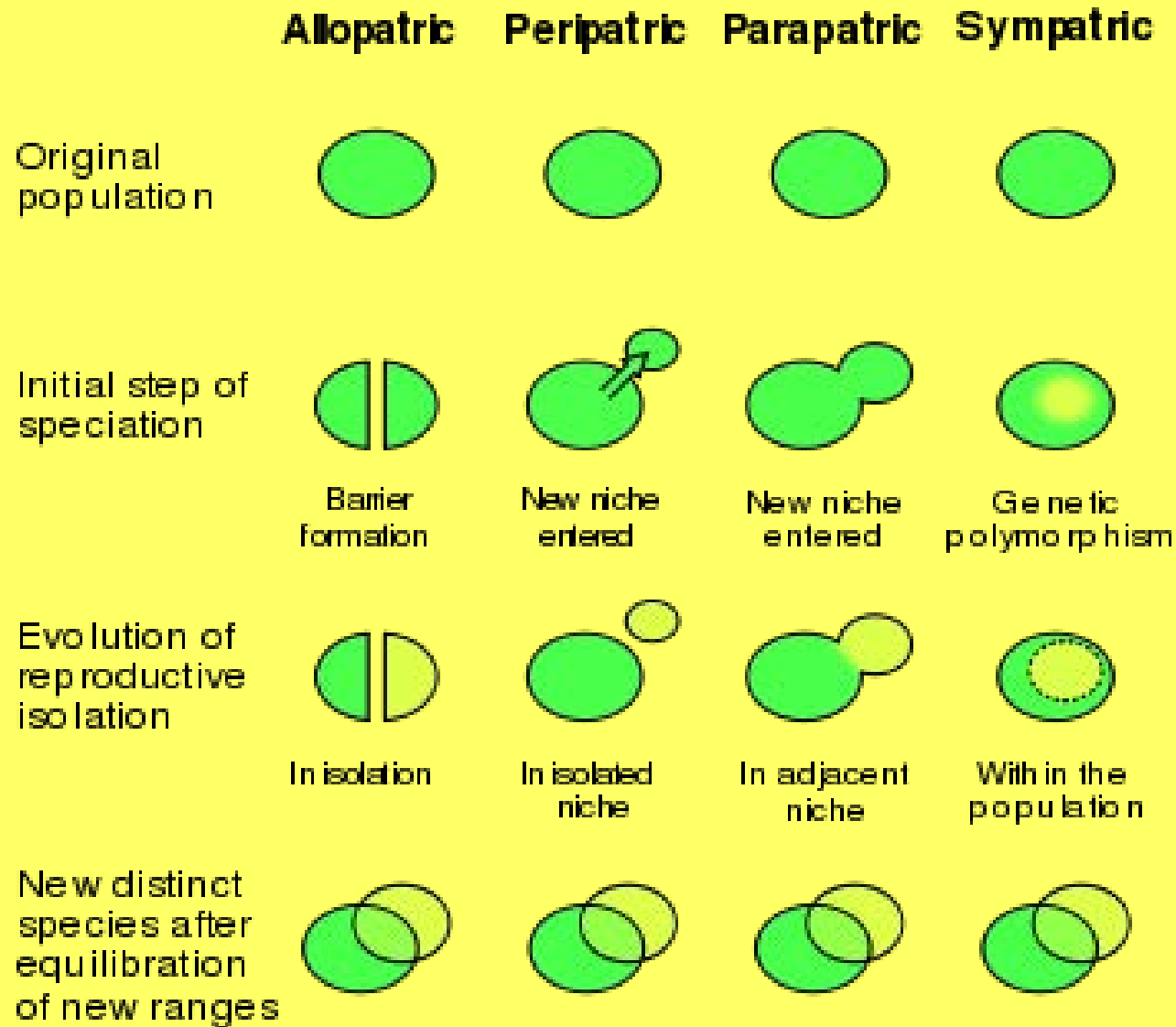
Biologists have discovered two populations of Eurasian songbirds in Siberia that show the strongest evidence yet of having evolved from a single ancestral species into two distinct ones. The map below shows the present ranges of the birds around the Tibetan Plateau, with gradations of color indicating where gradual changes have evolved between one subspecies and another.

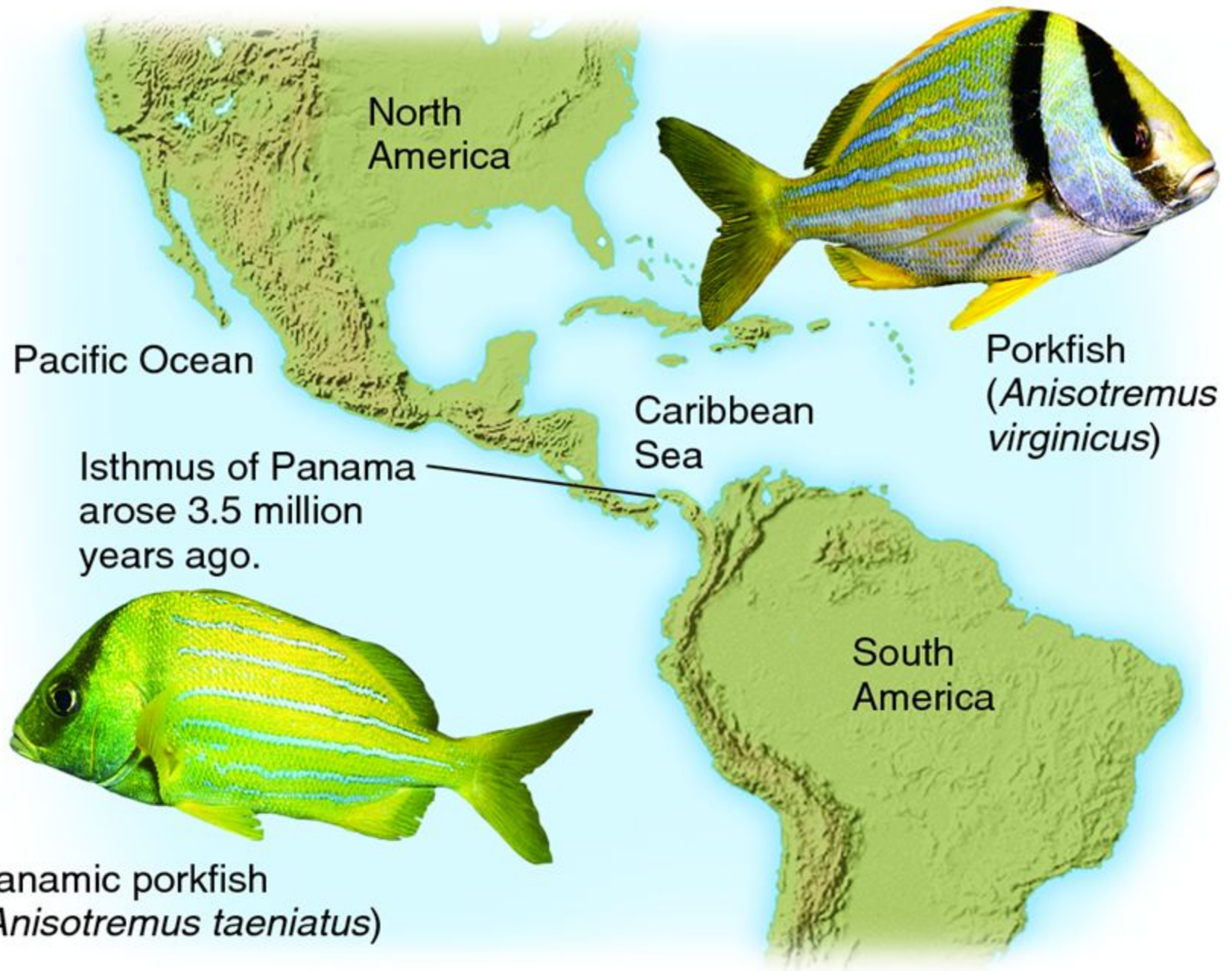


Rouxinol









Sympatric Speciation

- “Barriers” in sympatric speciation include chromosomal changes, habitat differentiation, & sexual selection.

– *Polyploidy*:

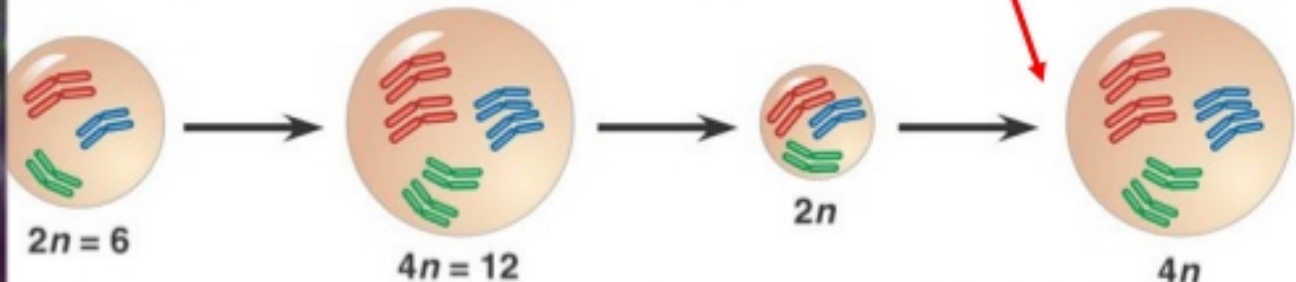
Tetraploids can only produce viable offspring with themselves (self-pollination) or other tetraploids= reproductive isolation



Failure of cell division in a cell of a growing diploid plant after chromosome duplication gives rise to a tetraploid branch or other tissue.

Gametes produced by flowers on this tetraploid branch are diploid.

Offspring with tetraploid karyotypes may be viable and fertile—a new biological species.



Sympatry



apple maggot flies



apples

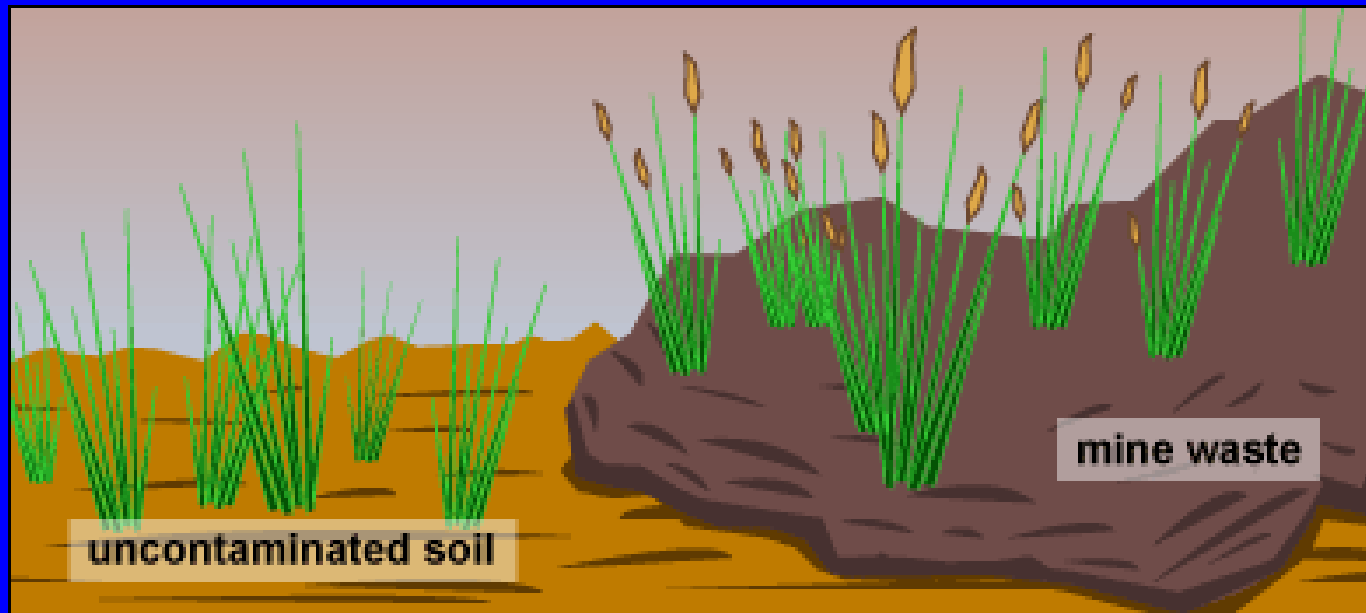


hawthorns

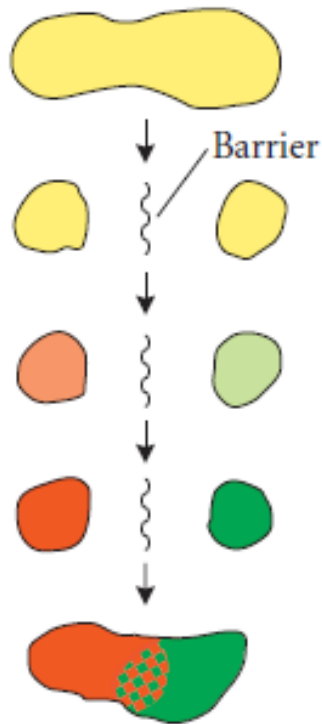


Gene flow has been reduced between flies that feed on different food varieties, even though they both live in the same geographic area.

Parapatría – nicho adjacente

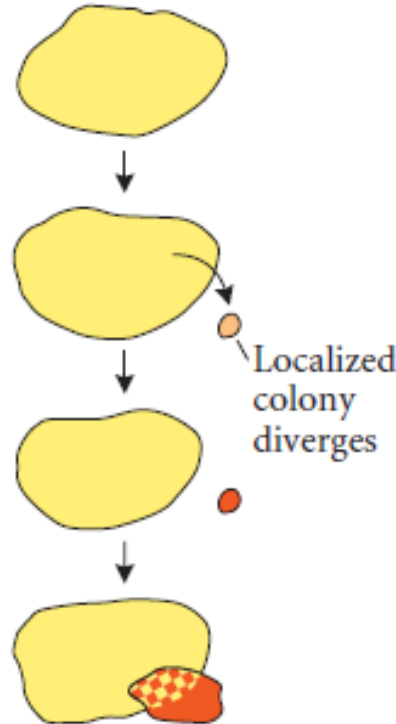


(A) Allopatric speciation by vicariance



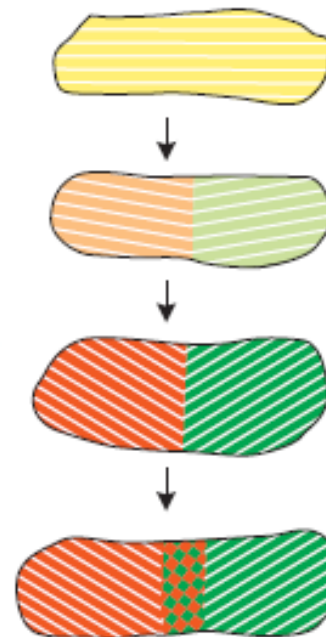
Barrier removed or new species disperse over it, re-establishing sympatry

(B) Peripatric speciation (founder effect)



Range expansion re-establishes sympatry

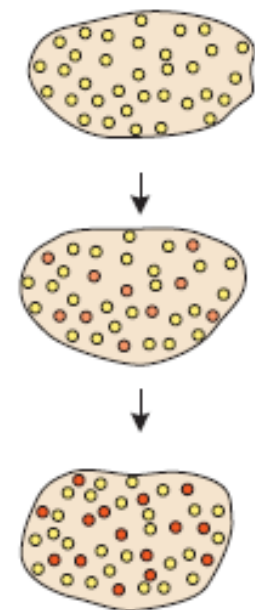
(C) Parapatric speciation



Range expansion leads to sympatry

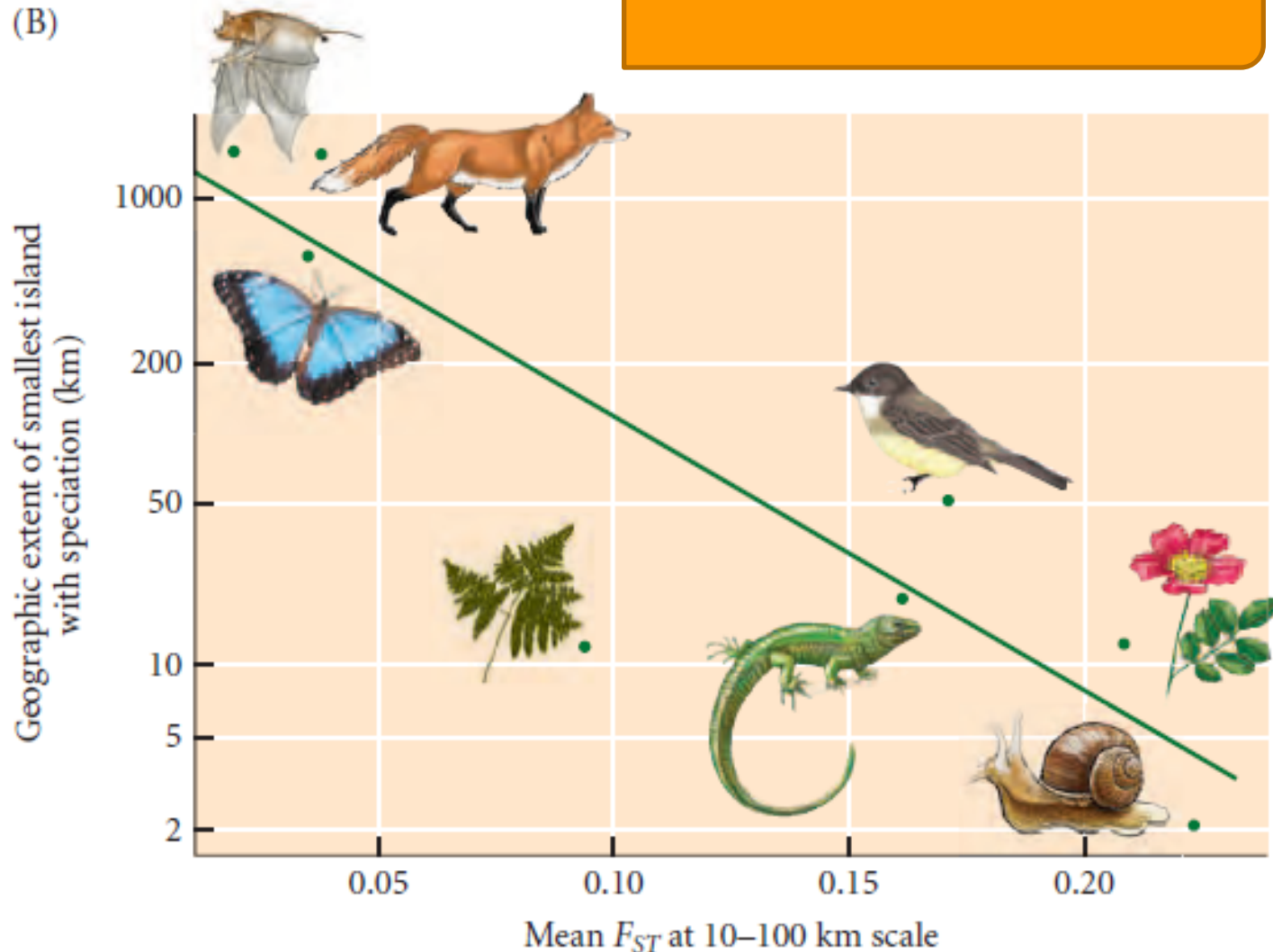
Divergent selection, even at a narrow environmental discontinuity, may oppose gene flow and result in reproductive isolation.

(D) Sympatric speciation



Genetic differences result in reproductive isolation

Especiaçãoção – tamanho da ilha e grau de fluxo genético



????

???:

- Porque ha diferentes espécies?
- Porque não cruzem entre eles para criar um continuo de formas?
- Pensa na resposta em termos de dificuldades mecânicas e em termos das consequências – os resultados destes tipos de cruzamentos seriam mais aptos do que os puros?

O que você deve saber

- Porque biólogos pensam que a maioria das espécies surgiram através de especiação alopátrica em vez de simpática?
- Quais são as consequências de seleção sexual – evidências e como afeta especiação?

Vagalumes



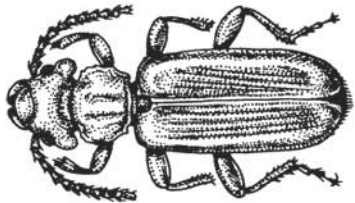
Isolamento reprodutivo e especiação em vagalumes

- Explicar como isolamento reprodutivo pode ter acontecido em vagalumes e como isto explica o numero de espécies.

espécies de insetos herbívoros e parentes carnívoros

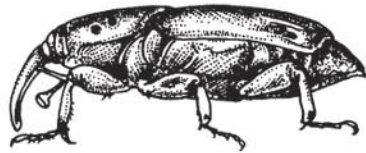
Explicar variação em numero de espécies

Cucujoid beetles



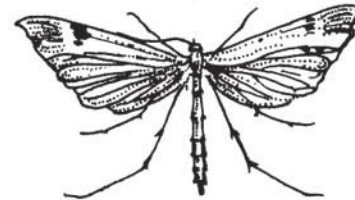
< 10,000 species

Weevils, leaf beetles,
and kin



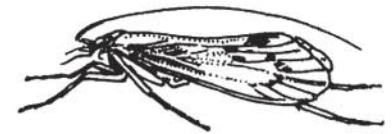
130,000 species

Moths and butterflies



140,000 species

Caddisflies



7,000 species

Herbivory

Herbivory