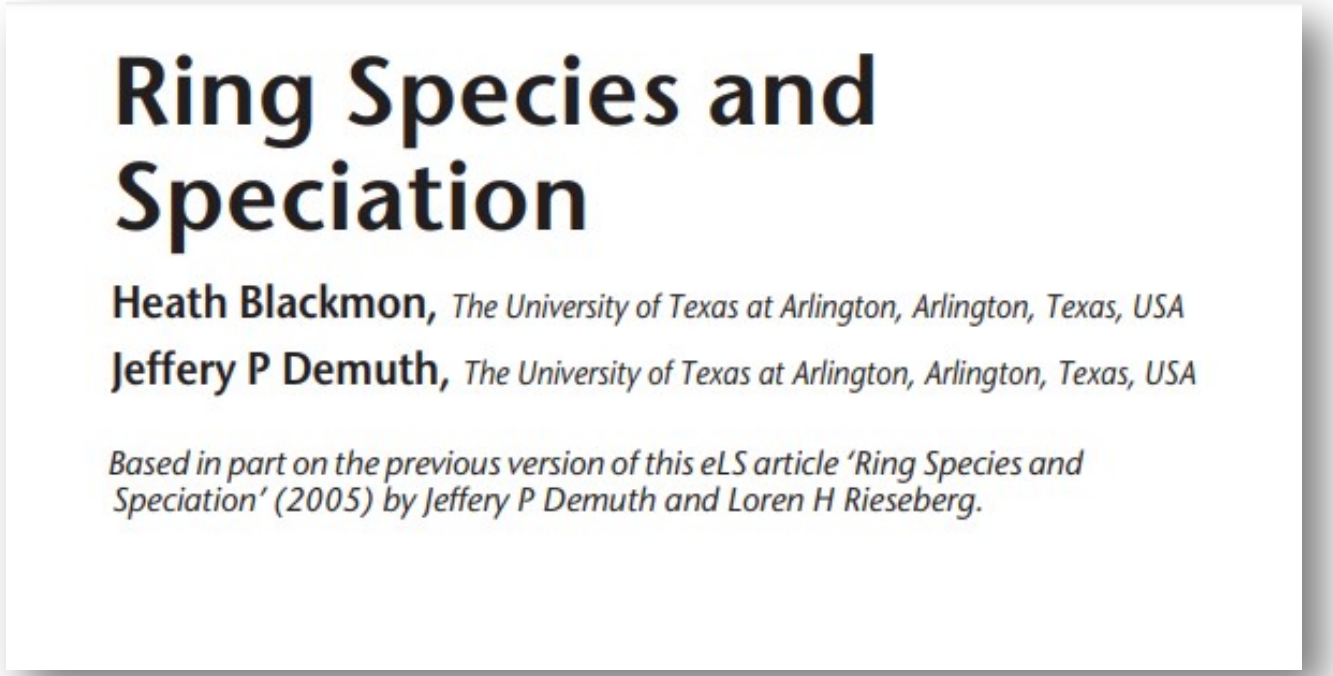


Ring Species and Speciation

Heath Blackmon, *The University of Texas at Arlington, Arlington, Texas, USA*

Jeffery P Demuth, *The University of Texas at Arlington, Arlington, Texas, USA*

Based in part on the previous version of this eLS article 'Ring Species and Speciation' (2005) by Jeffery P Demuth and Loren H Rieseberg.

RING-SPECIES

By

Tatiana Sepúlveda

May 26/2020

What is a species?

Hypotheses

Traits

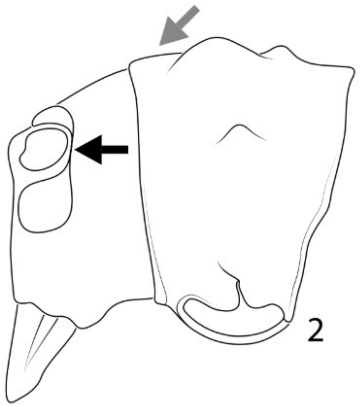
Boundaries

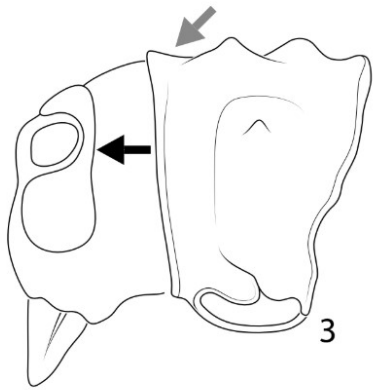
Copestylum (Phalacromya) andicolum (Bigot, 1884)

What is a species?

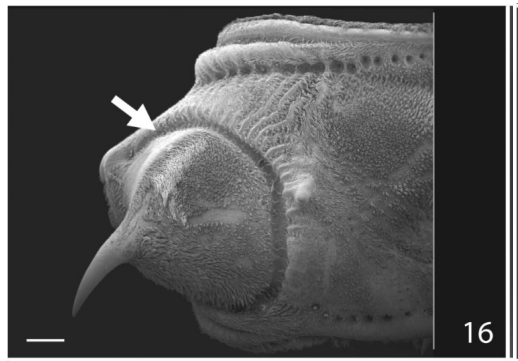
(Souza et al. 2020)

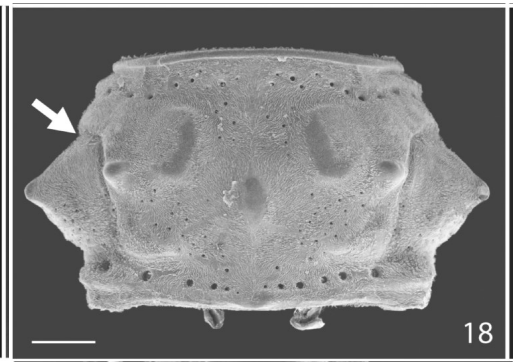
Acanthoderes daviesi

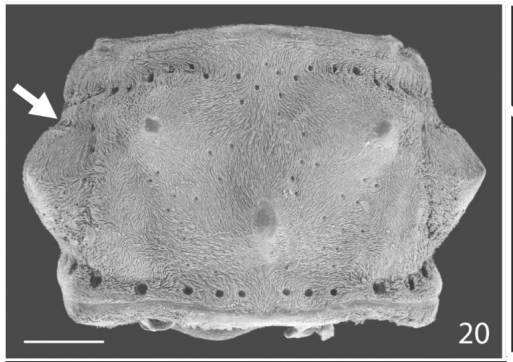


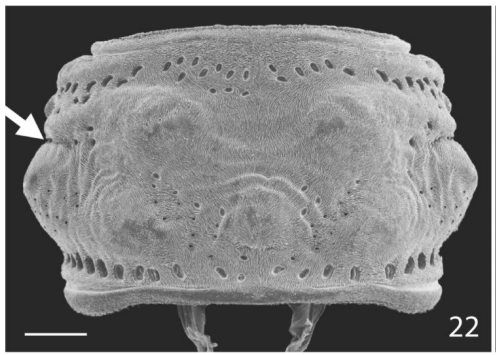


Oreodera glauca glauca





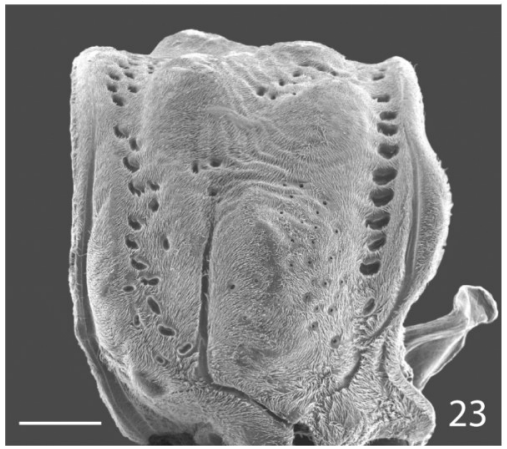




Acrocinus longimanus

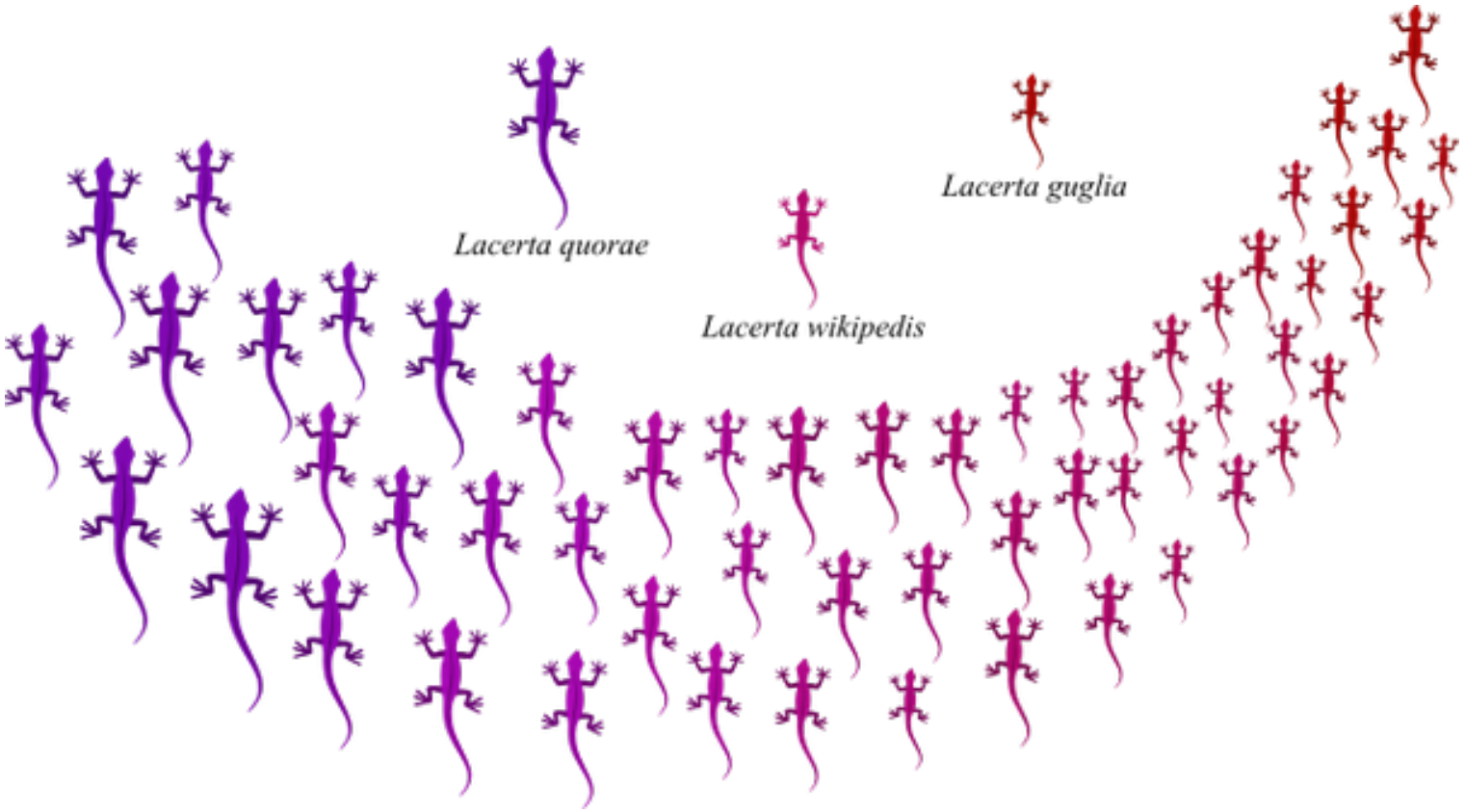
Macropophora trochlearis

Oreodera glauca glauca

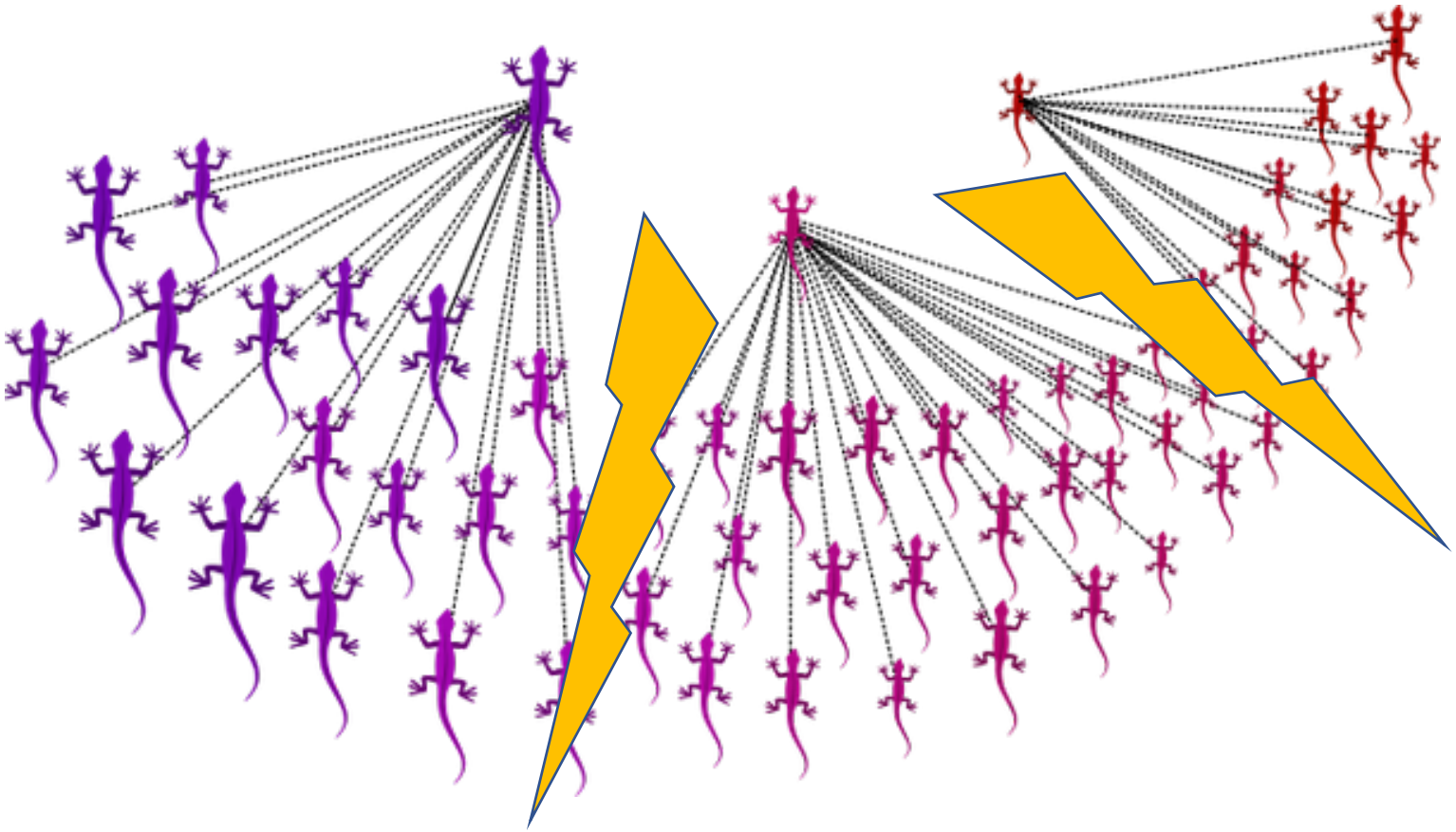


Oreodera hoffmanni

What is a species?

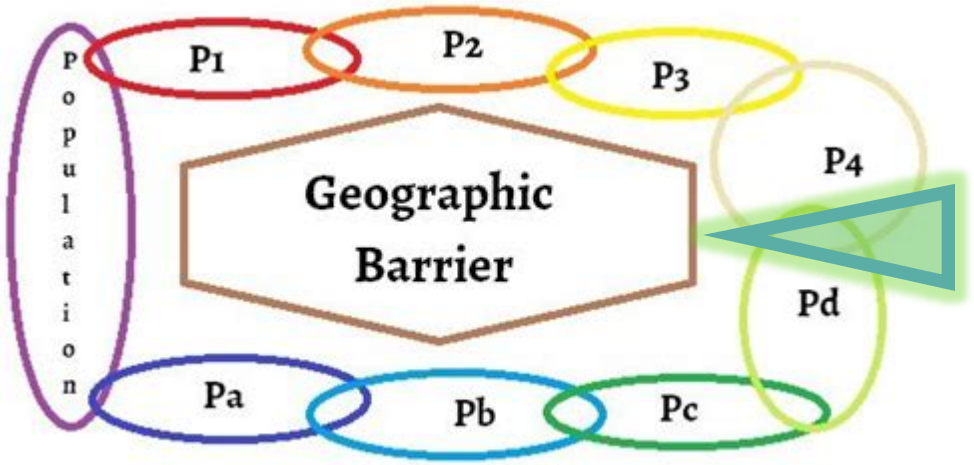


What is a species?



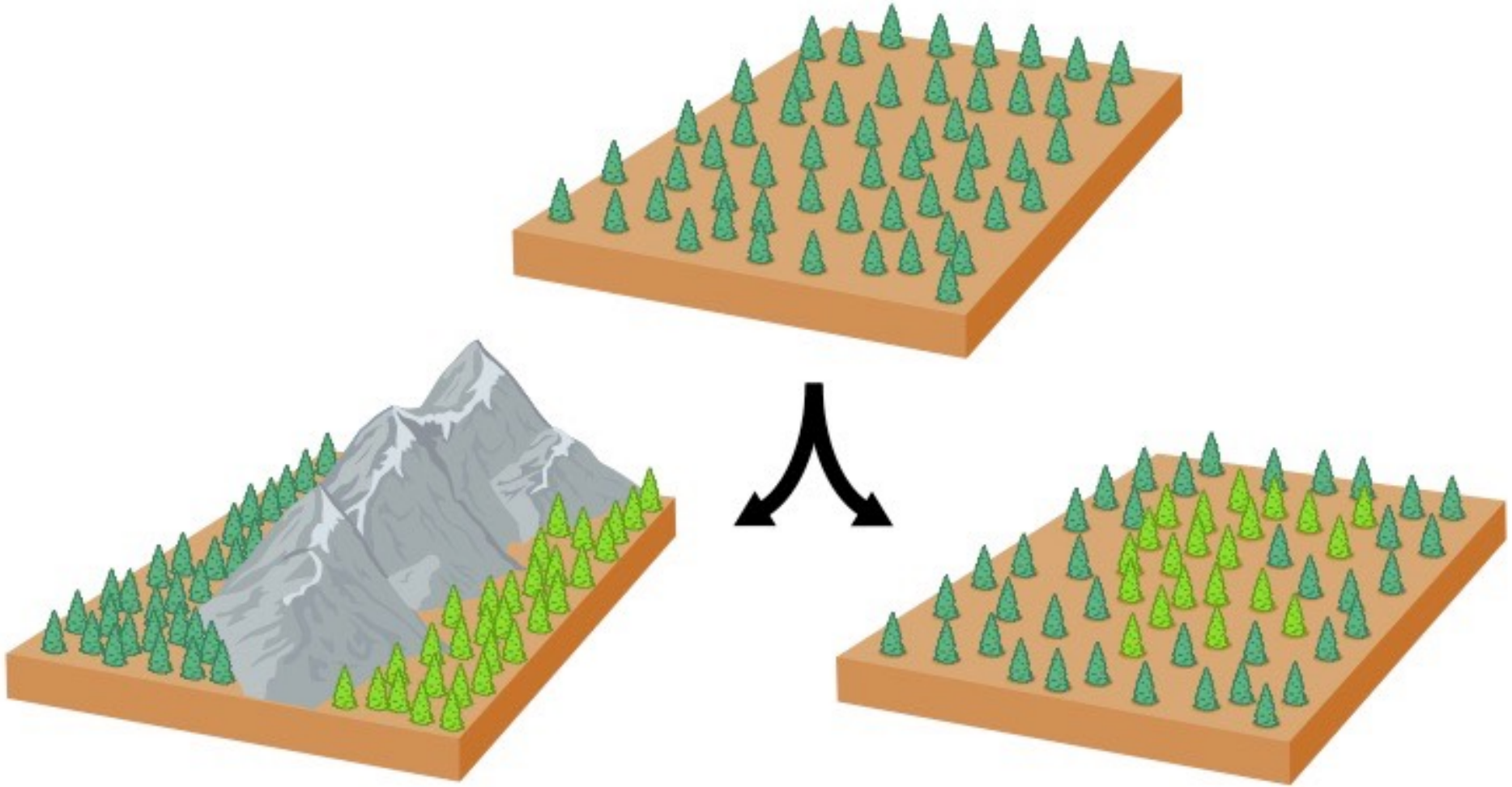
What is a species?

Ring-species



"Chain of intergrading subspecies forms a loop or overlapping circle of which the terminal links have become sympatric without interbreeding, even though they are connected by a complete chain of intergrading or interbreeding populations"

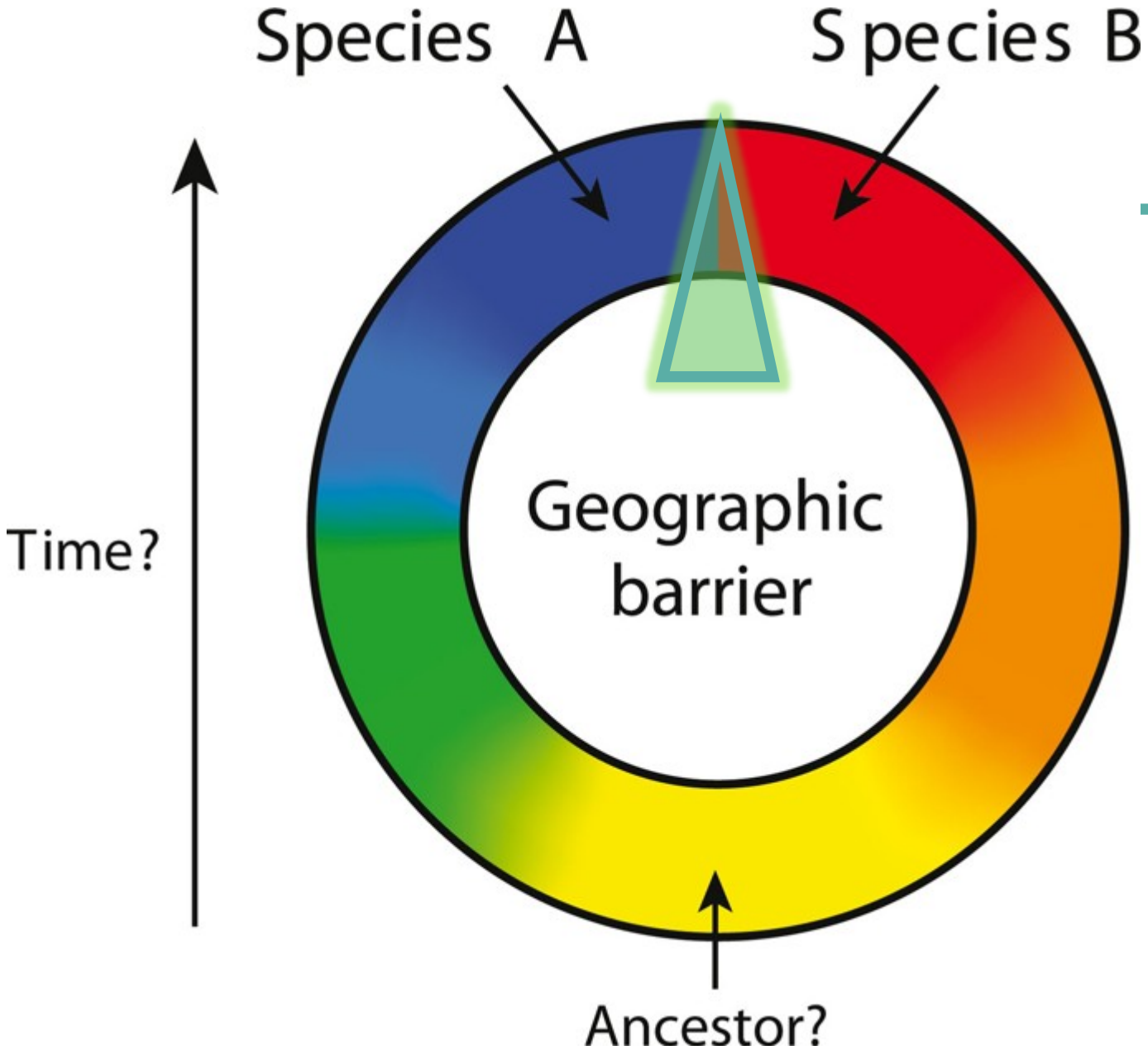
(Mayr, 1963)



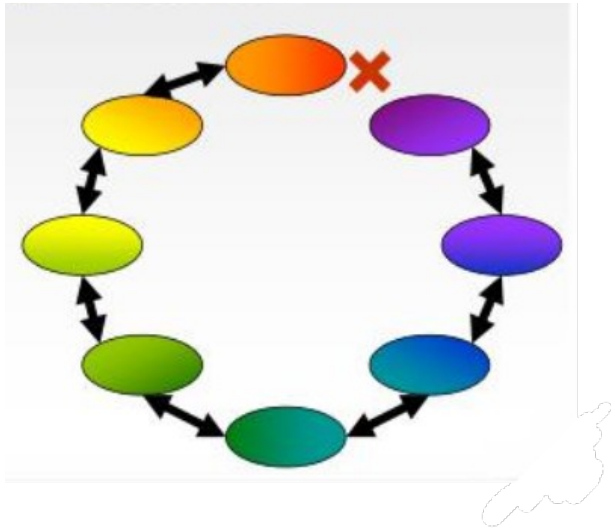
Allopatric Speciation
(geographical isolation)

Sympatric Speciation
(reproductive isolation)

Ring-species

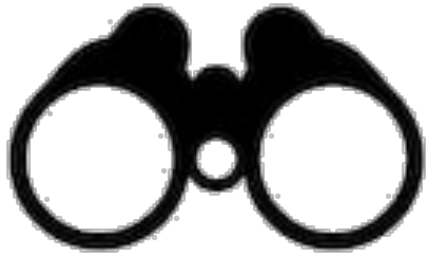


Ring-species



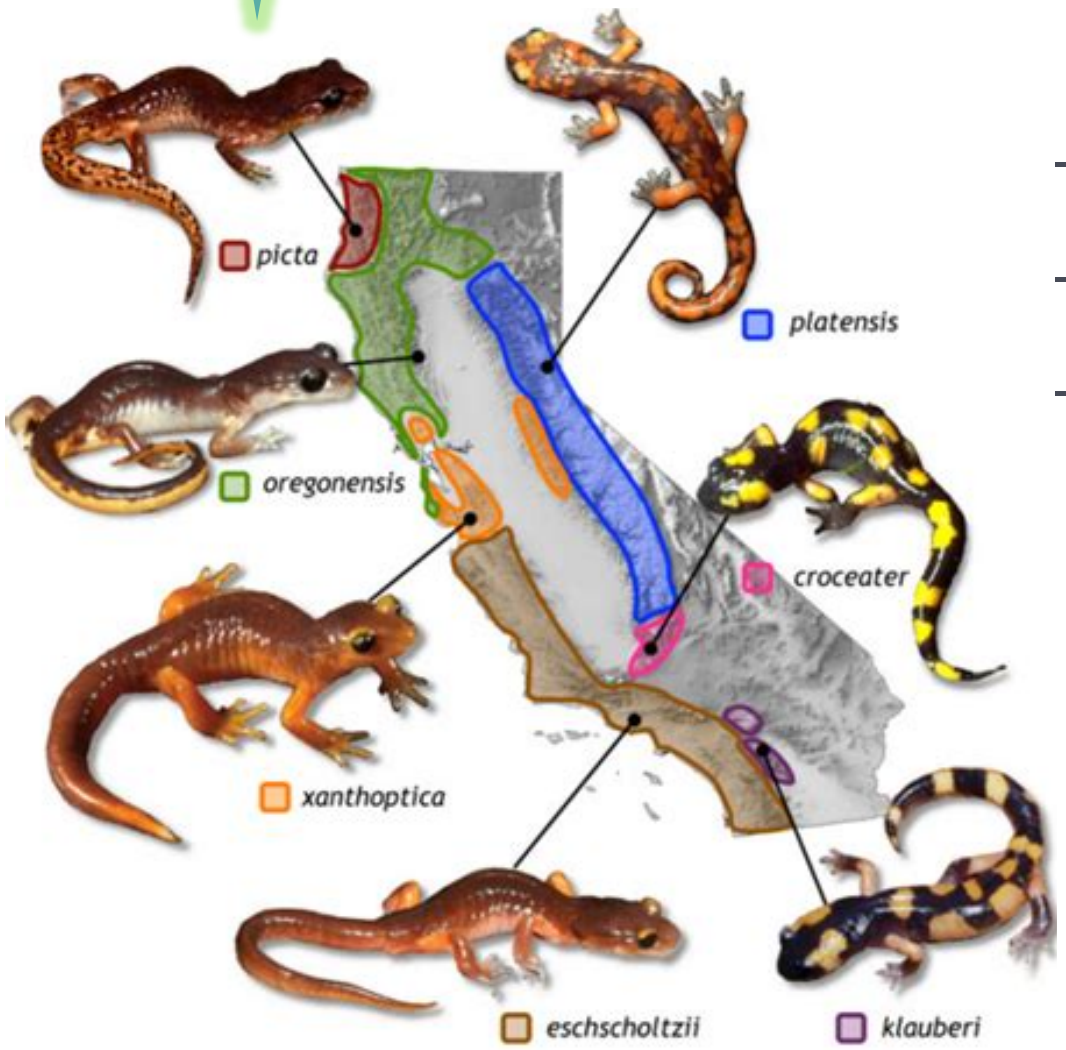
- Circular distribution
- Chain of intergrading populations

  (morphological discontinuity and cryptic barriers to gene flow).



Geographic Speciation

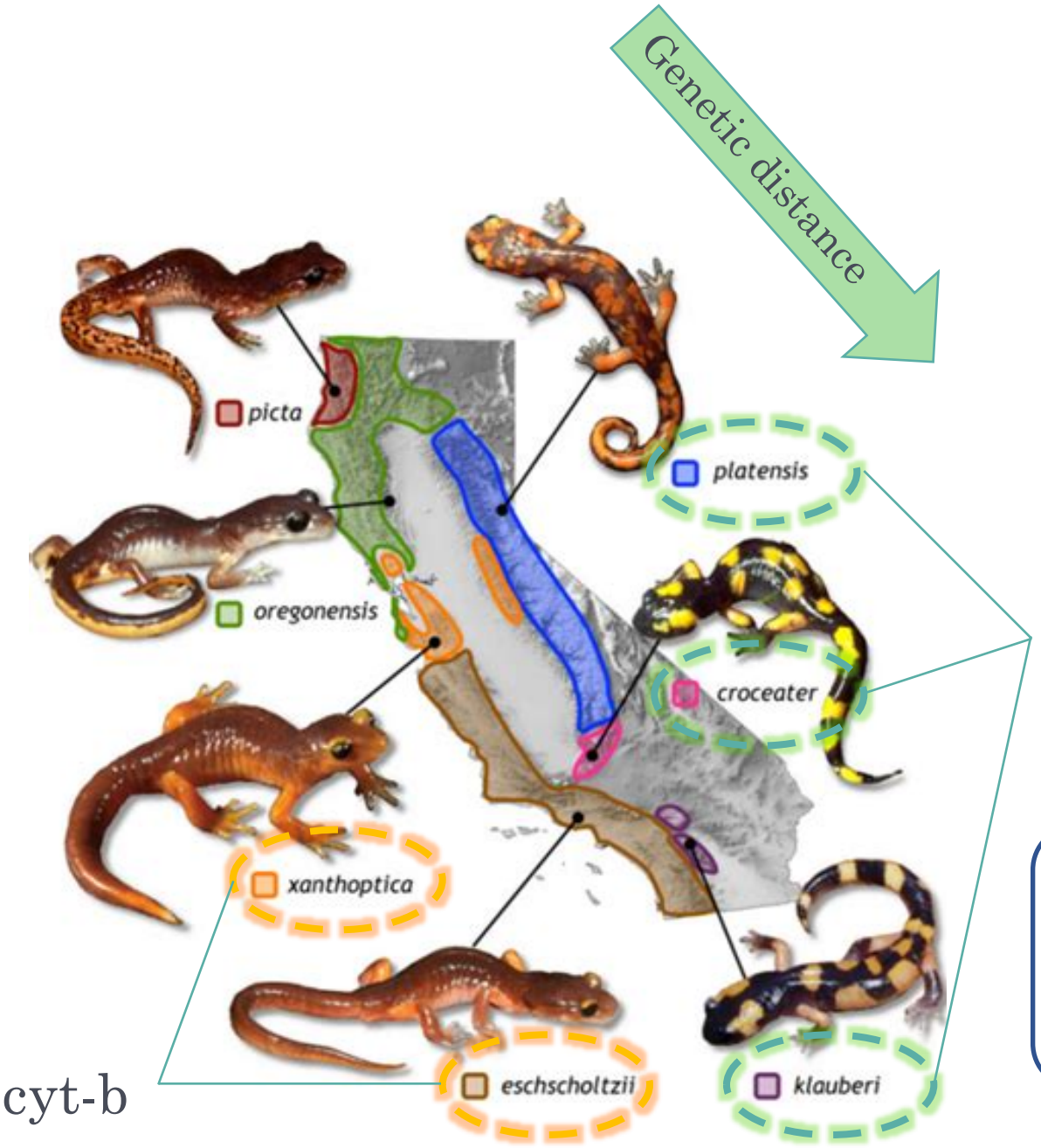
Ensatina salamanders



- Seven subspecies of *E. eschscholtzii*
- 3/1/3 coloration
- Free interbreed in nothern Cal. but hibridize ocassionally in Central Cal. and not interbreeding at South Cal.

picta-like ancestor

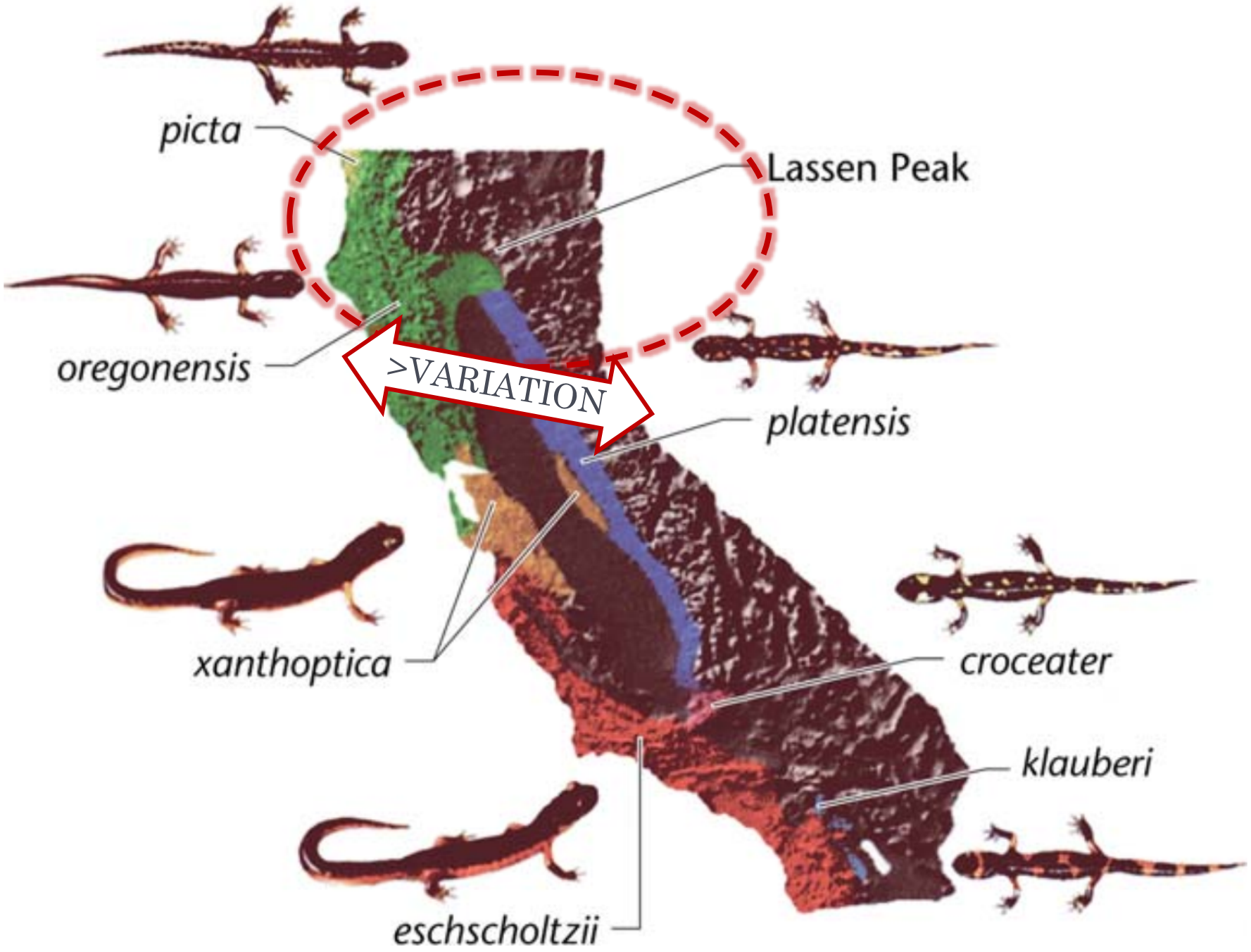
(Stebbin)

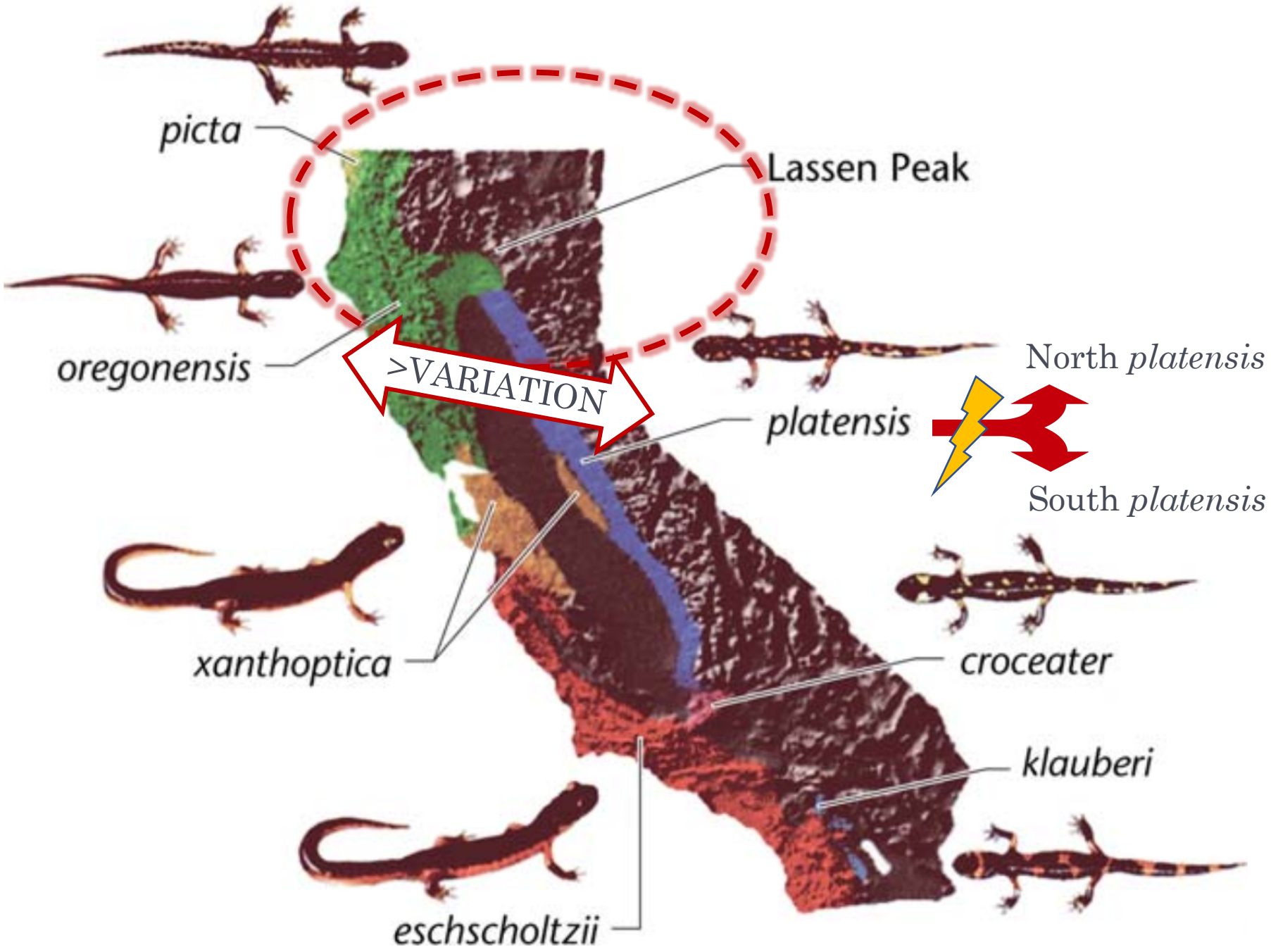


– Despite being the simplest explanation, molecular data supports part of Stebbin's hypothesis.

cyt-b
(Moritz et al. 1992)

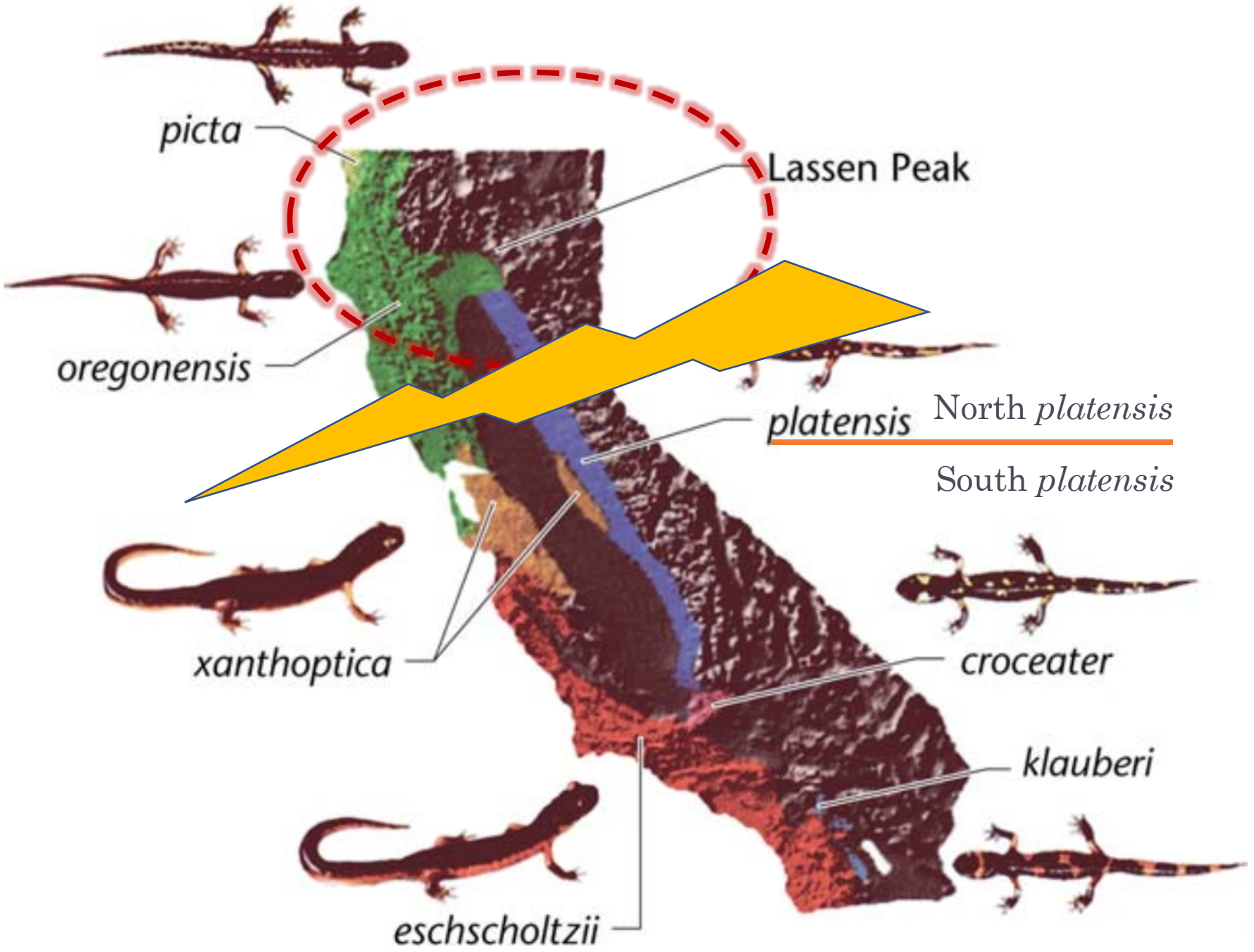
southern subspecies confirm Stebbin


picta
Lassen Peak
oregonensis
>VARIATION
platensis
xanthoptica
croceater
klauberi
eschscholtzii



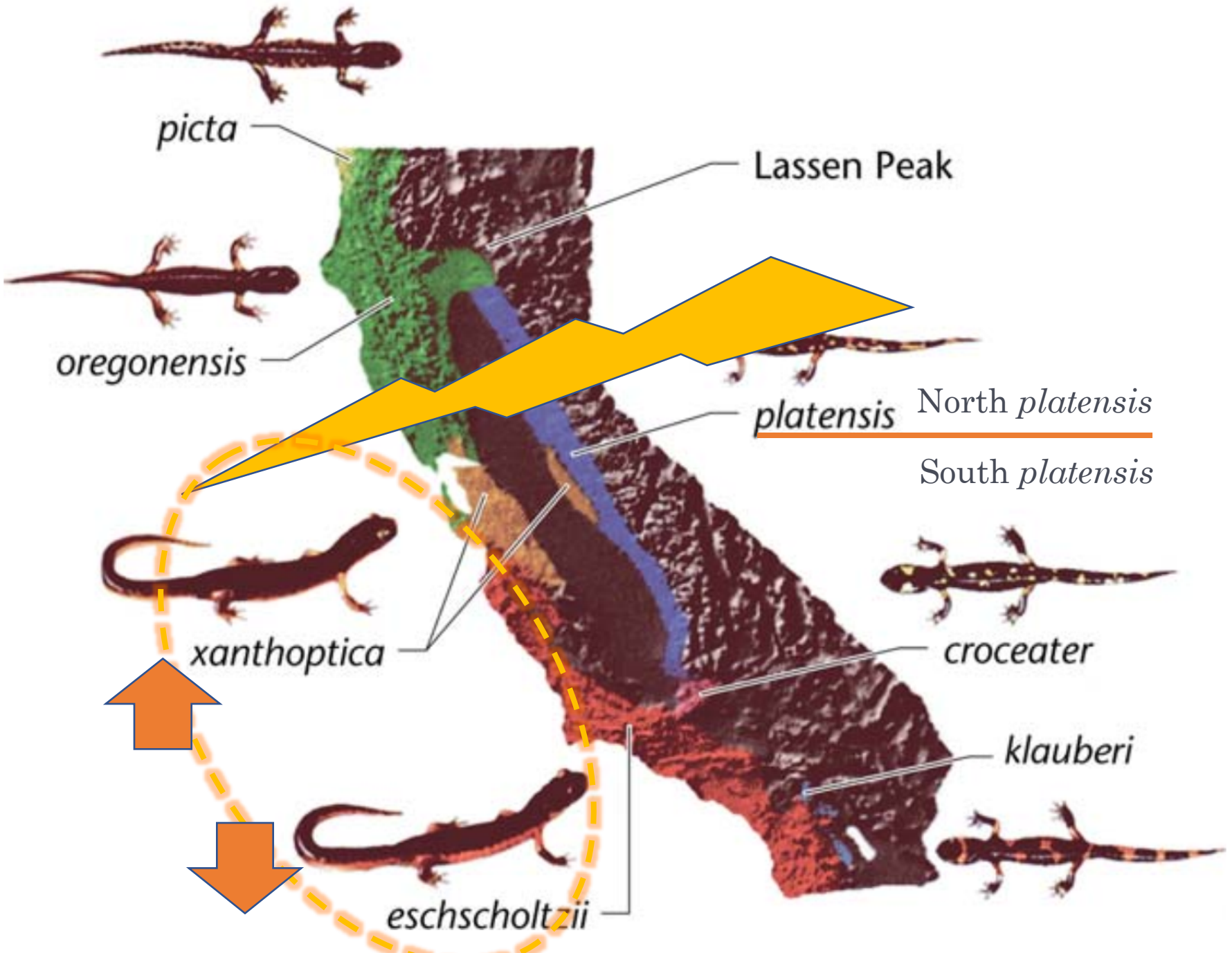
Northern *platensis* is the product of introgression between Southern *platensis* and *oregonensis*.

(Jackman & Wake, 1994)



Southern boundary is due to ancient **vicariance**; whereas, the presently distinct transition between *oregonensis* and northern *platensis* is due to geologically recent volvanism and glaciations.

(Jackman & Wake, 1994)



Historical biogeography

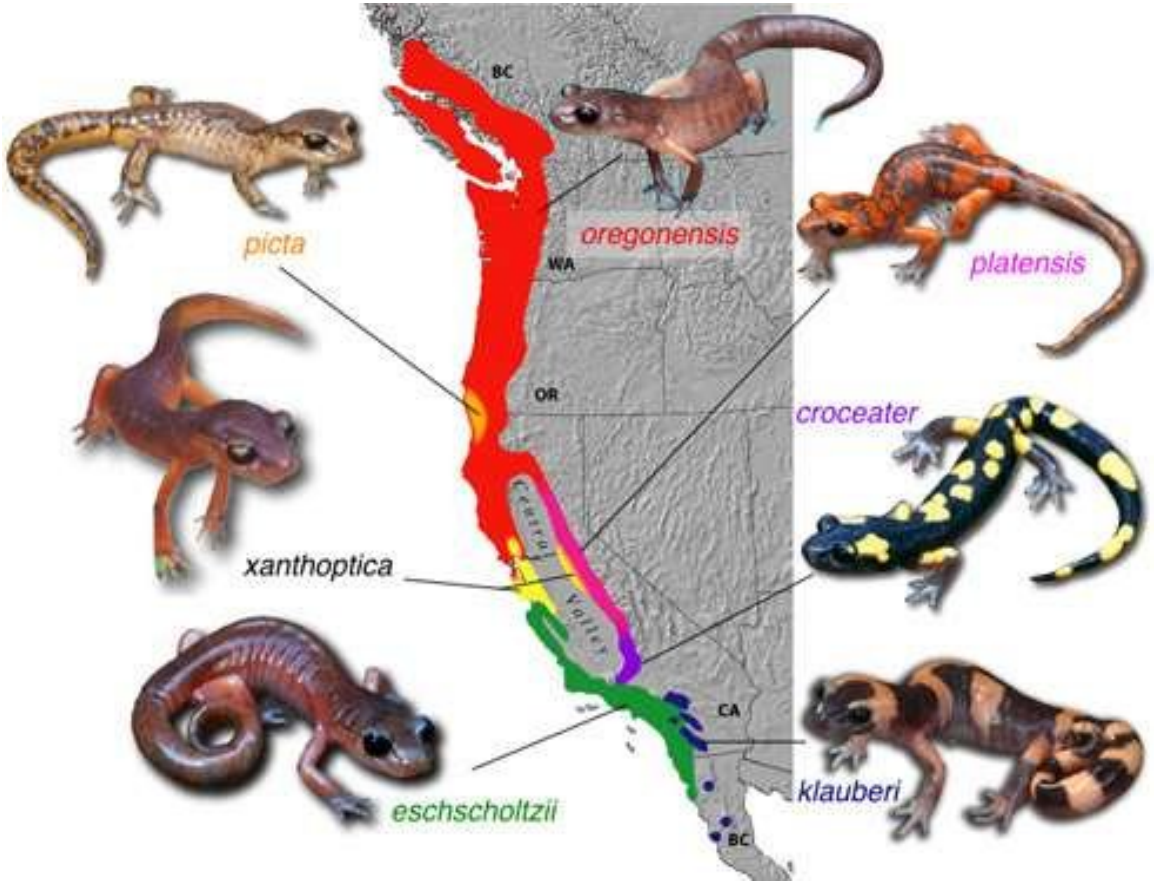
600.00 ya.

8.9-10 Ma.

xanthopica & eschscholtzii ancestor dispersing to an archipelago and then later invading the mainland.

(Wake, 2006)

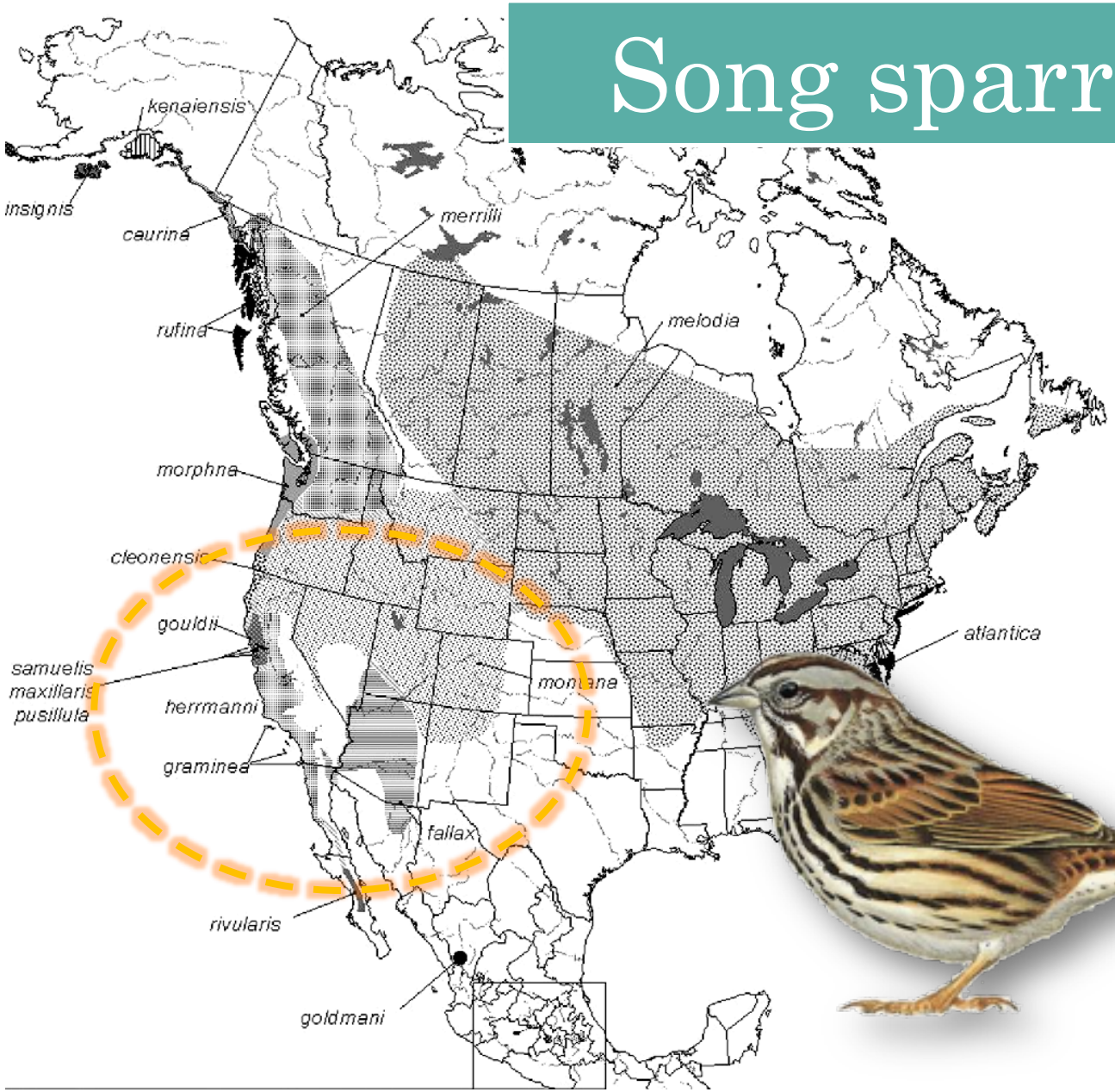
Ensatina salamanders



Hyp. 1: Phylogenetic approach, mantaining the subspecies (Wake & Schneider, 1998).

Hyp. 2: Genetic approach, *Ensatina* is a superspecies with 11 allopatric and parapatric species and semispecies (Highton, 1998).

Song sparrow



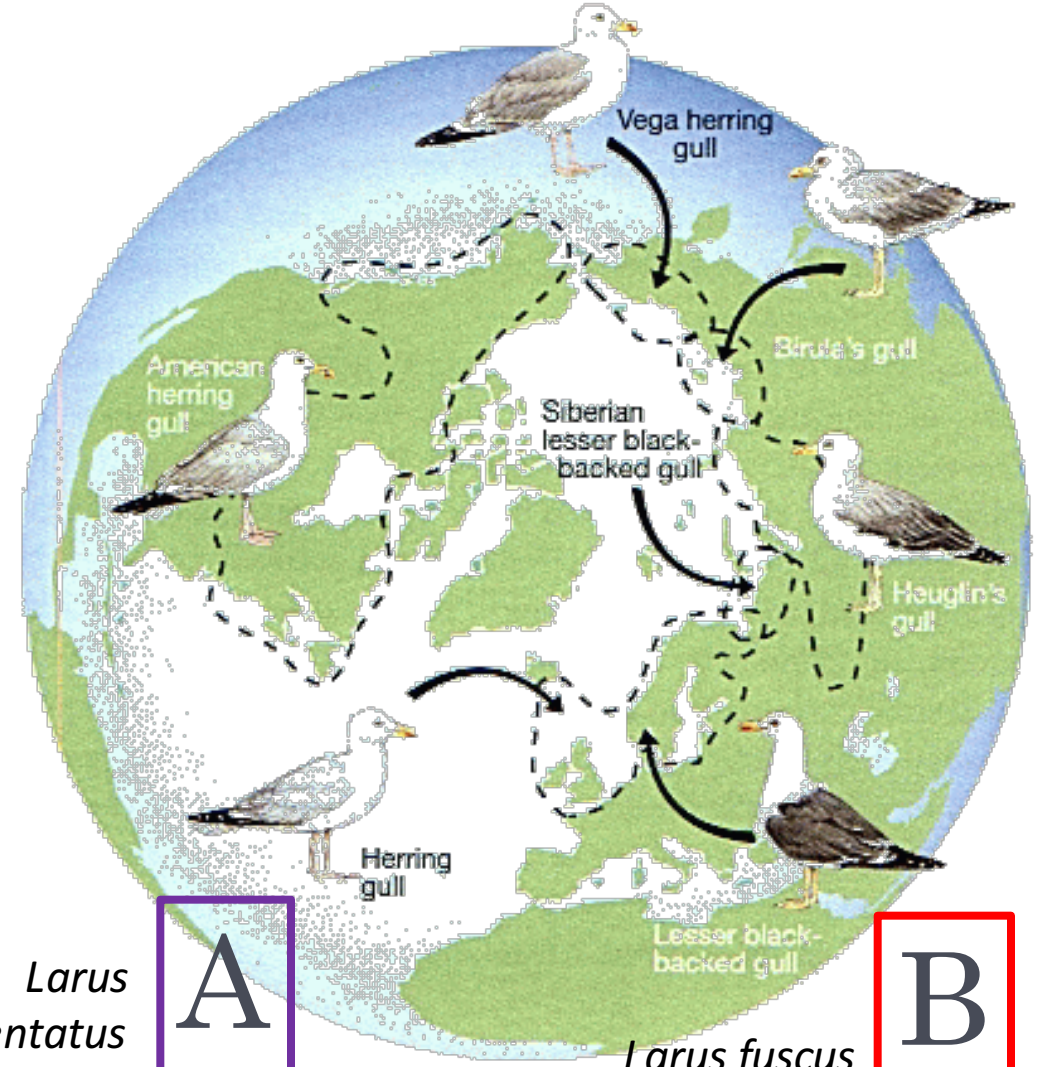
Melospiza melodia 25–52 subspecies described

hermanni & *fallax* overlap in the Southern Coachella Valley.

Barrier: desert of eastern California and sputhern nevada

Result: assortative mating

European gulls



Larus argentatus A

B *Larus fuscus*

The original phylogeographic hypothesis suggesting that *L. argentatus* is the end result of circumpolar eastwards colonization of Europe from North America (reviewed in Mayr, 1963).

However, additional molecular data, including mtDNA sequences, suggest that *L. argentatus* and *L. cachinnans* are closest descendants of gulls from two different, isolated glacial refugia (Liebers et al., 2004).

Result: **Allopatic speciation**, not ring species

P.t. obscuratus

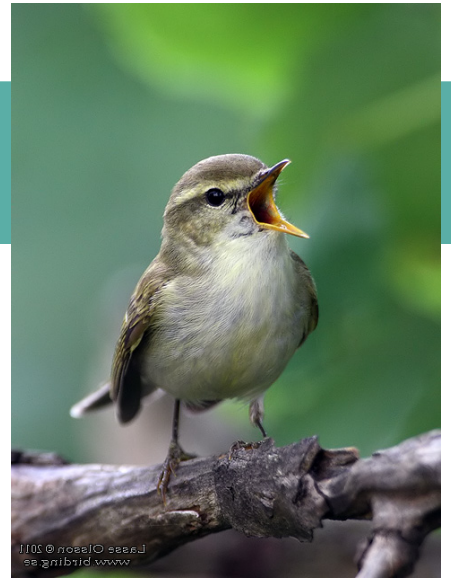
P.t. trochiloides

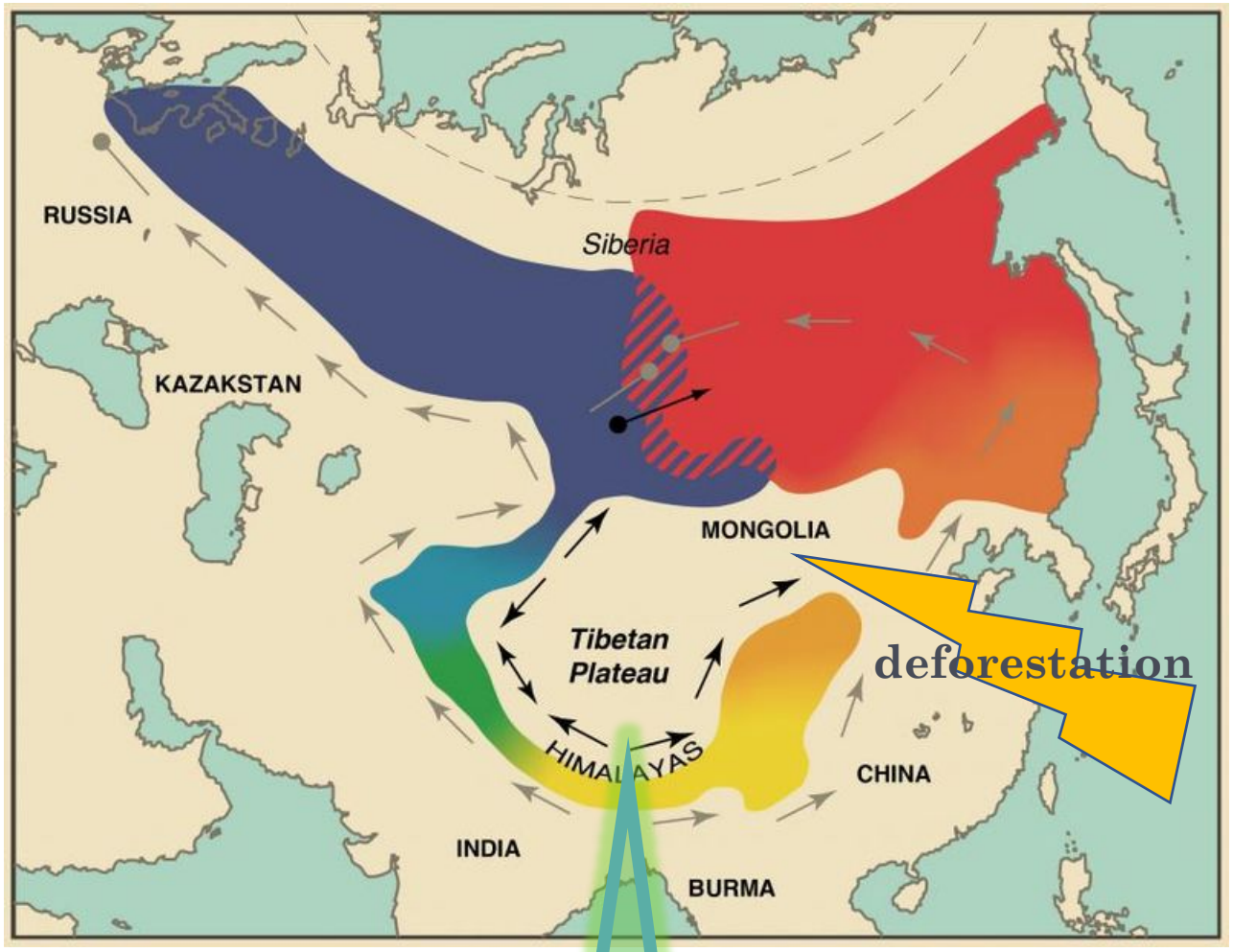
P.t.ludlowi

Greenish warblers

Phylloscopus trochiloides

6 subspecies described





The study found that song structure diverges gradually around the ring and is substantially different between the two reproductively isolated Siberian subspecies

Irwin (2000).

Titmice ~ Greenish warblers

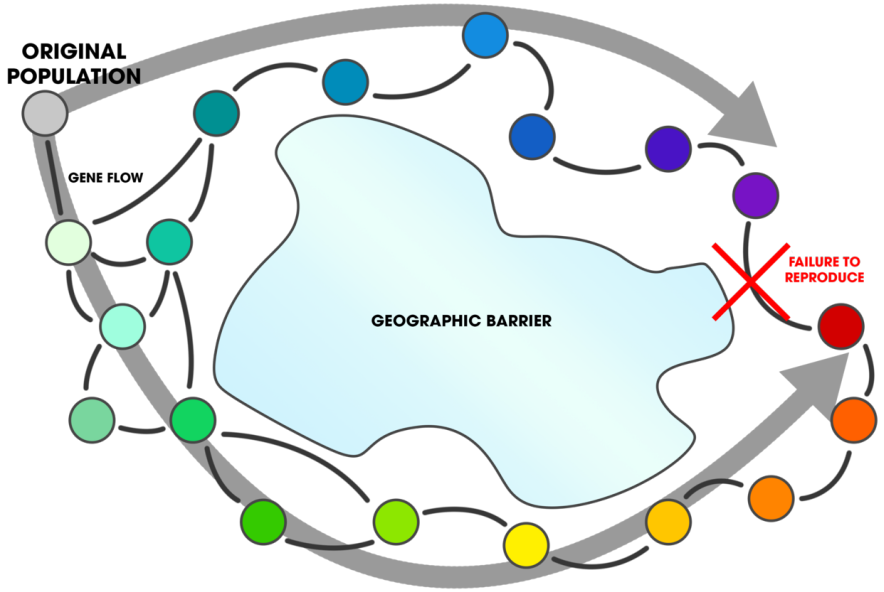
Pocket mice ~European gulls

Darkling beetle

Solitary bees

African Acacia

Relevance of Ring-species



- They are rare
- Allow studies of gene flow and speciation (morphological discontinuity and cryptic barriers to gene flow).

Ring species can be valuable tools for disentangling the roles of ecological and geographic isolation in speciation.

kalilak