Bio1B Evolution 8

Last lecture:

Sexual selection

- Mating systems (pp 1136-7)
- Intra vs intersexual selection (481-482)
- Female preference: Direct benefits (resources) vs indirect (good genes)

Today

Evolution of sacrifice (altruism)

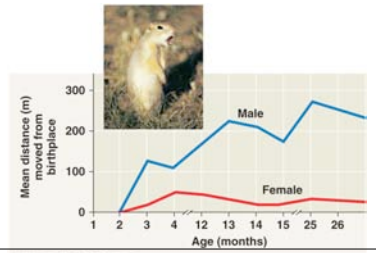
Species & speciation

- What is a species anyway? (Pp. 487-492)
  - Concepts - typological, biological, phylogenetic
  - Reproductive isolation - mechanisms
  - Easy one? - Humans & living relatives
  - Interesting one - Ensatina salamanders
- Speciation processes - introduction & geography; adaptive radiations

When to sacrifice? - if it helps a relative - lots… [pp 1138-1140]

- "Kin selection theory" (W. Hamilton)
- Help if: rB > C: r = %shared genes, B = benefit, C = cost
- Haldane: "I would not lay down my life for a brother, but would do so for 2 brothers or 8 cousins)"
- Social insects: inheritance system => higher "r" => increased cooperation

Tuco tuco - co-parenting by females in social groups (Eileen Lacey, IB)



Belding's ground squirrels: females more related and give more alarm calls (Fig. 51.29)

Kin selection and cooperative courtship in wild turkeys

Alan H. Krakauer (2005) Nature 434:69

Estimates of relatedness from molecular data

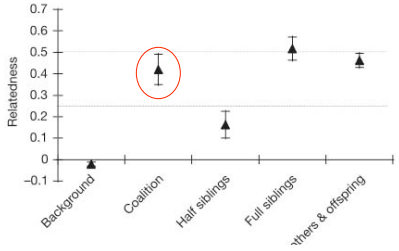
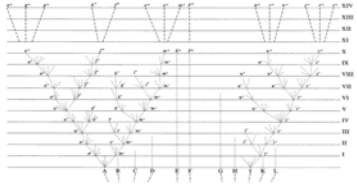


Table 1 **Calculation of Hamilton's rule, $rB - C < 0$**

Variable	Description	Calculation	Value*
r	Coefficient of relatedness	Mean pairwise relatedness of subordinates to their dominant display partner	0.42
B†	Benefit to dominant	(No. of offspring per dominant male) – (no. of offspring per solo male)	6.1 (9.0)
C†	Cost to subordinate	(No. of offspring per solo male)– (no. of offspring per subordinate male)	0.9 (2.3)
	Net benefit†	$rB - C$	+1.7 (1.5)

What is a species?

Typological (pre-evolutionary eg. Aristotle, Linnaeus)



Evolutionary

NeoDarwinists — Systematists — Darwin

Reproductive isolation

Biological SC

Groups of populations reproductively isolated from others

Character change

Phylogenetic SC

Diagnosable clusters with common ancestry (molecular or morphological)

Discontinuities: DWM + extinction

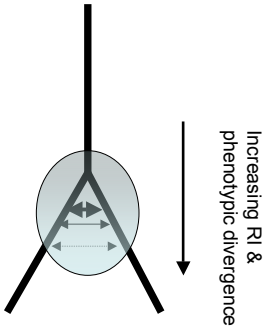
Morphological SC

Phenotypically distinct sets of populations

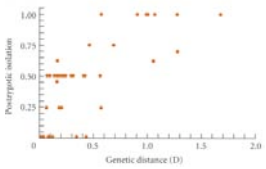
Reconciling different perspectives

Forms of **Reproductive Isolation**
(see Fig. 24.4 - but no set sequence)

- Prezygotic
  - Separation of mating
    - Habitat, Timing, Behavior, Mechanical
- Gamete recognition
- Postzygotic
  - Viability (F1 or later), Fertility

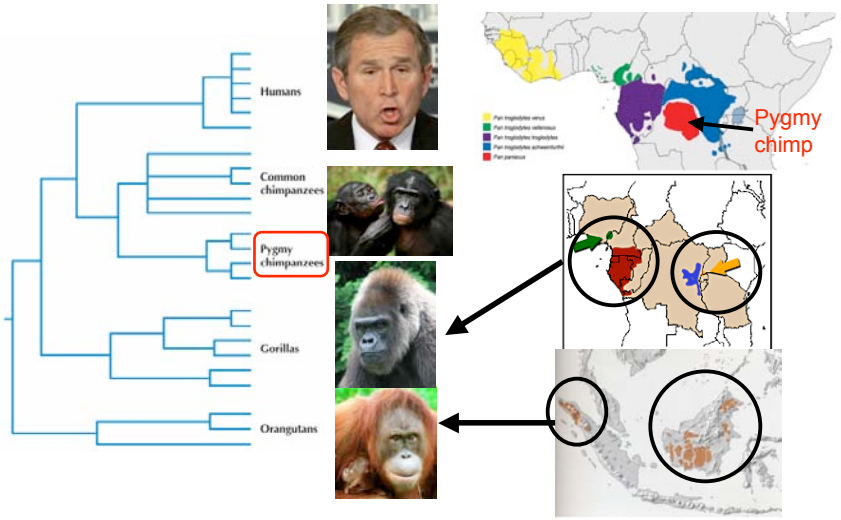


Postzygotic RI increases with genetic divergence

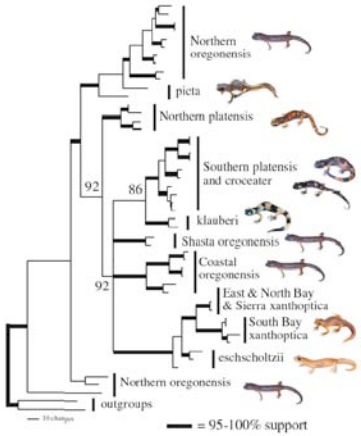


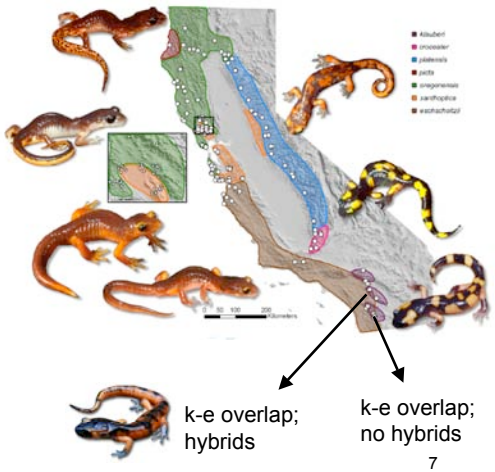
General lineage concept: focuses on the process - not how to recognize species

Species of Hominidae



Ensatina eschscholtzii - One ring species? Or 2 biological species? Or >11 Phylogenetic species

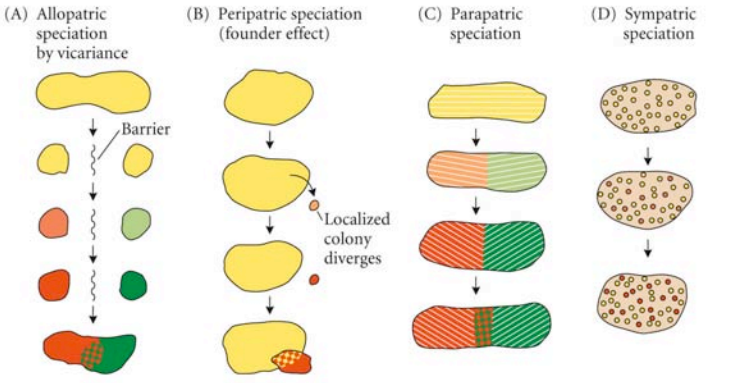




k-e overlap; hybrids

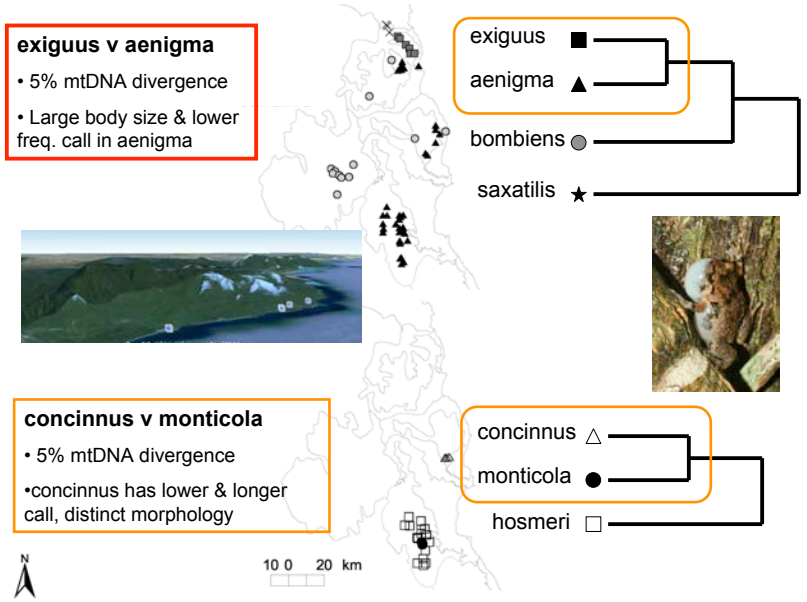
k-e overlap; no hybrids

Geographic modes of speciation

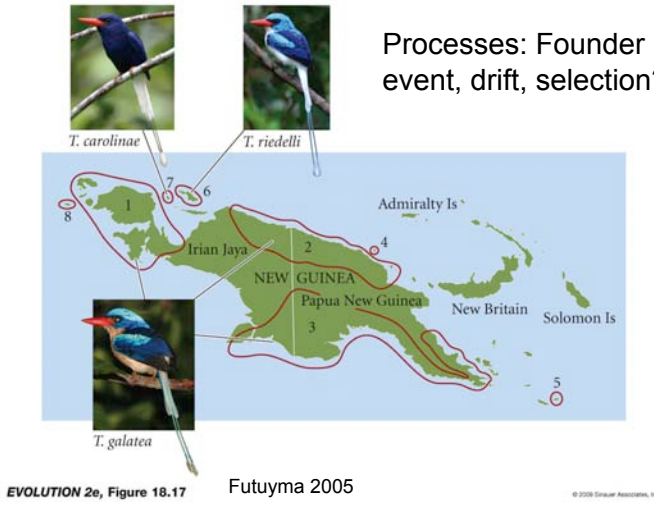


EVOLUTION 2e, Figure 18.1 Futuyma 2005

Allopatric sister species among northern, montane *Cophixalus* (Hoskin 2004)



Peripatric speciation: paradise-kingfishers in New Guinea (Mayr)

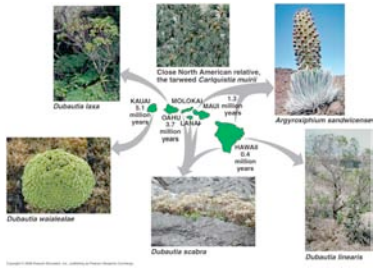


Processes: Founder event, drift, selection?

Futuyma 2005

Adaptive radiations (pp. 524-5)

- Rapid speciation with ecologically-driven divergent selection
- Common on remote islands or other novel environments following colonization
- Promoted by isolation & ecological opportunity



e.g. Hawaiian silverswords (Fig. 25.18)

Other examples: African cichlids, Hawaiian arthropods, Andean lupines, Carribean anole lizards etc etc