Hawaiian Vegetation Fire Effects Internship Opportunity

We are seeking motivated, enthusiastic, physically fit individuals to assist with research on the impacts of an invasive scaly sword fern (*Nephrolepis multiflora*) and lava-ignited wild fires on native Hawaiian rainforest in Hawaii Volcanoes National Park. Work will involve backcountry hiking and possibly camping in various terrain and weather conditions. Field sites are located in Hawaiian rainforest communities with lava substrate and native matt ferns reaching 30' in height. Vegetation will be identified, measured and biomass sampled. Interns will occasionally assist the park's vegetation management program. Three internship positions will begin April 1st and end either June 1st (2 positions) or July 1st (1 position). Roundtrip airfare between Portland and Hilo, dorm style housing within Hawaii Volcanoes National Park, and a daily meal reimbursement ($25/day) will be provided. Preference will be given to individuals with coursework in botany/forestry or related fields. If interested send a cover letter, resume, and names of three references to alison.ainsworth@oregonstate.edu and mychal.tetteh@oregonstate.edu.
Environmental Biology 206

206 Course Web Link:

- Postponed a few things on website
- Thank T. Edwards and M. Herron
- Exam Wed 16 Feb
- Miller Chapter 3
  (check out the CD/website for Miller text)
Fig. 1: Zomlefer 1994

- **Paraphyletic**
- **Polyphyletic**
- **Monophyletic**

**Xerus erythropus**

**X. princeps**

**X. inauris**

**Spermophilopsis leptodactylus**
'Reptilia' (= 4 orders, without birds)

1. **Testudines** (Chelonia, Turtles)
   - duh
   - shell shape ~ ecology
   - no arboreal or gliding forms

2. **Squamata** ('Lizards' and Snakes)
   - lizards not monophyletic
   - repeated loss of limbs
   - very diverse

See Fig 2-1 (Pough et al., 2001)
‘Reptilia’ (= 4 orders, without birds)

3. **Crocodylia** (Crocodiles, Alligators, Caiman)
   - threatened (21 spp. remain)
   - snout shape ~ diet
   - related to **archosaurs**
     (birds and dinosaurs)

4. **Rhynchocephalia** (Sphenodontida, Tuatara)
   - 2 extant species
   - islands of New Zealand
   - operate at ~cold temperatures

**Ranking Biodiversity?**

\[
R_i = (D_i + U_i)(\delta P_i/C_i)
\]

D = distinctiveness  
U = utility  
\(\delta P =\) enhanced probability of survival  
C = cost of strategy

Direct **limited funds**...  
Ecological Contribution?
DNA sequence Codes for Proteins etc.

Genetic Code

- A (adenine),
- T (thymine), [U (uracil)]
- C (cytosine),
- G (guanine)

(Coding, sense strand)

\[ \text{ATGGATCTCGCTC} \]
\[ \text{TACCTTAAGAGCGAG} \]
(Template, antisense strand)

\[ \text{AUGGAUUCCCGCU} \]
(mRNA made from Template strand)

1-Transcription
2-Translation

Proteins of amino acids

The Genetic Code
Natural Selection:

Ricklefs 2001, Figure 16.14

- **Stabilizing selection** favors average traits.
- **Directional selection** favors one extreme.
- **Disruptive selection** favors both extremes.

Ricklefs 2001, Figure 16.15

- **Result of Disruptive Selection** (favors both extremes).
**Drosophila Bristle Count**

Disruptive Selection
(Favors Both extremes)

Disruptive
Directional Stabilizing

Ridley 1996

Figure 4.5 Experimental disruptive selection on ommatidial bristle number in the fruity Drosophila melanogaster. Individuals with many or few bristles were allowed to breed, while those with intermediate numbers were not. The population rapidly diverged. Adapted with permission from Thoday and Gibson (1962). Copyright 1962 Macmillan Magazines Limited.

Figure 5-6 Three ways in which natural selection can occur, using the trait of codominance in a population of peas. In directional selection, changing environmental conditions select organisms with alleles that deviate from the norm so that their offspring (fitter, colored allele) make up a larger proportion of the population. In stabilizing selection, environmental factors eliminate the fittest individuals (light and dark-colored peas) and increase the number of individuals with average genetic makeup (intermediate-colored peas). In disruptive selection, the number of intermediate-colored peas increases and greatly reduces those with extreme traits (light- and dark-colored peas).
Stabilizing Selection for Human Birth Weight

Figure 6.24: Stabilizing selection on birthweight in humans. The horizontal axis represents birthweight. The left vertical axis and the histogram show the distribution of birthweights in a sample of 105,930 babies. The average birthweight is about 7 pounds. The right vertical axis and the data points with best-fit curves show mortality rate as a function of birthweight (on a logarithmic scale). The mortality rate is much higher among very small and very large babies than among babies of average size. (Note that in this figure, mean is plotted as probability of survival, whereas in Figure 6.25, mean is plotted as probability of surviving.) The optimum birthweight is that with the lowest mortality rate. It is very close to the population average. Natural selection on birthweight in this population tends to hold the population average at a constant value. From Cavalli-Sforza and Bodmer (1971) and reference therein.

Stalk Eyed Flies

Sexual Selection
Speciation often result of:
1. Geographic Isolation
2. Reproductive Isolation

Evolution by Natural Selection

vs. Lamarck
Darwin to the Galapagos

Figure 19.5 These sketches by John Holden illustrate various explanations for the occurrence of similar species on landmasses that are presently separated by vast oceans. (Reprinted with permission of John Holden)

Tarbuck and Lutgens 1999
**Galapagos Marine Iguana (Iguanidae)**

*Only lizard to feed at sea*
- algae, seaweed

*Up to 10 or 12 m deep*
*Up to a hour-long dives for large males*
(Darwin shipmate)

*Highly social*
- 8,000 indivs/ km of coast

*16 islands*
*Cold upwelling water* nourishes algae

**Fernandina/Isabela**
- males to 10+ kg
- females to almost 3 kg

**Genovesa**
- males only to 1 kg
- females to < 1 kg

*Why?*
*Water temperature and current strength*
Galapagos Marine Iguana (Iguanidae)
Galapagos Marine Iguana (Iguanidae)

*El Nino* → lack of food (Why?)

Starvation b/c high cost of salt excretion

Animals may lose 15% body length
- bone absorption

Only adult vertebrate known to regularly shrink
(astronauts)

Largest animals die
- sexual selection
- natural selection
Primary Succession.
Similarities to Hawaii?
   total # species, # endemics?

   Why feed in the sea?
   Why salt glands?
   Why no fear of humans?

   Amblyrhynchus cristatus
   Galapagos Marine Iguana
   Charles Darwin visited 1830s.
   Theory of
   Evolution by Natural Selection

   SHOW VIDEO!

   Speciation?
   (Adaptive Radiation to fill available niches)

   Ground Finches