Biology of the Galapagos

Wikelski reading, Web links

26 March 2009, Thurs
ECOL 182R UofA
K. E. Bonine

Alan Alda Video?

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Student Chapter of the Tucson Herpetological Society

COME JOIN!!!!!

General Information…

- Herpetology: the branch of zoology having to do with the study of reptiles and amphibians.
- What We Do: Education outreach, Fun Trips, Exposure to reptiles and amphibians.
- Meeting Time and Location: Every third Thursday of every month; outside, on the North side of Biological Sciences East. Except on March 26, 2009 (b/c spring break).

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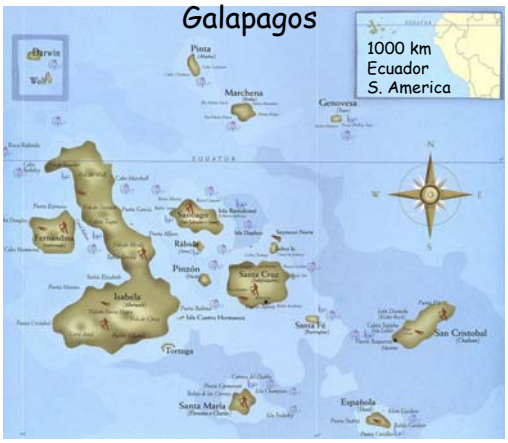

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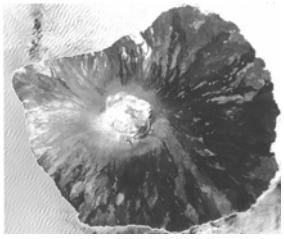
Origins of the Galapagos

(first islands about 10mya,
oldest current islands ____)
What happened to the older ones???

Oceanic or Continental Islands?



Stationary ____ creates islands, then tectonic plate "rafts" east

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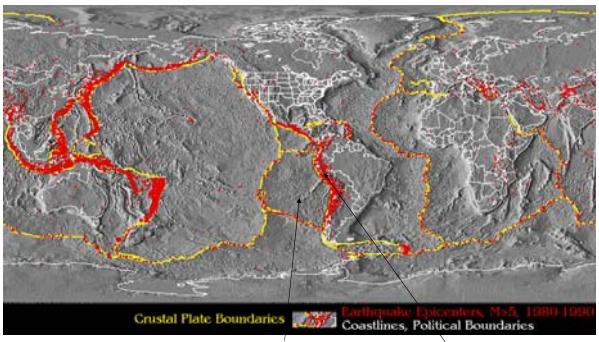
Plate Tectonics



Nazca Plate

Andes

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Colonization of the Galapagos
(who got there and how?)

Galapagos

Humboldt Current

Pough et al. 2004

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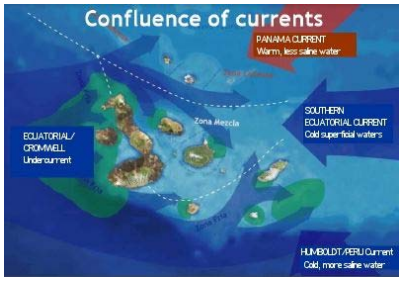
Colonization of the Galapagos
(who got there and how?)



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HOW MANY?

-Birds
-Frogs
-Lizards & Snakes
-Mammals
Marine or Terrestrial?
-Plants

Galapagos difficult to colonize.
Some taxa make the journey better than others.

Many _____ species than _____ .

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_____

... is the diversification of a single or small groups of species into a large number of descendant species that occupy various ecological niches.

This is an evolutionary process driven by natural selection.

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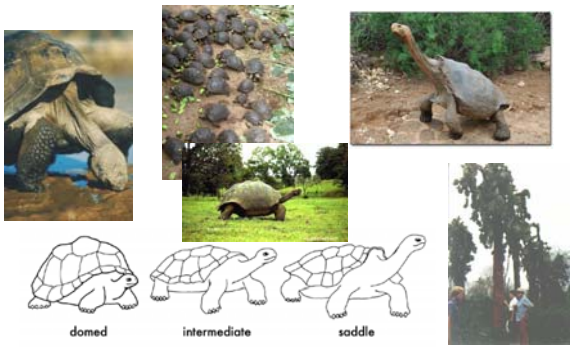
_____



Scalesia spp.

There are 15 currently recognised species plus five subspecies of *Scalesia*; species are shrubs but four commonly grow into trees. All are endemic to Galapagos. They are an excellent example of adaptive radiation, the development of new species to fit different vegetation zones and islands. There is great diversity between species:

- Species vary in size, from less than one meter to over 10 meters in height.
- Leaves vary in size and shape between species and are usually hairy. Leaves cluster at ends of twigs.
- The flowers are carried in white, daisy-like heads of 15 (*Scalesia cordata*) to 300 (*S. villosa*) small flowers.
- Some species grow mainly in the arid zone while others, especially the larger trees, are adapted to the humid zone.

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Mockingbirds

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Daphne Major, Peter and Rosemary Grant, Princeton

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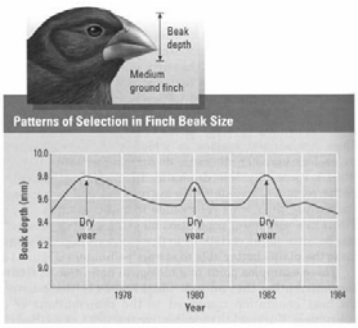

▲ **Figure 14-31** The Grants documented changes in beak size among medium ground finches over many years.

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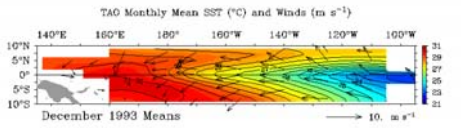
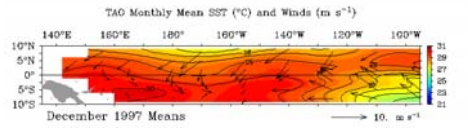
El Niño
is an oscillation of the ocean-atmosphere system in the tropical Pacific

http://kids.earth.nasa.gov/archive/nino/intro.html 18

Normal Conditions:



El Nino Conditions:



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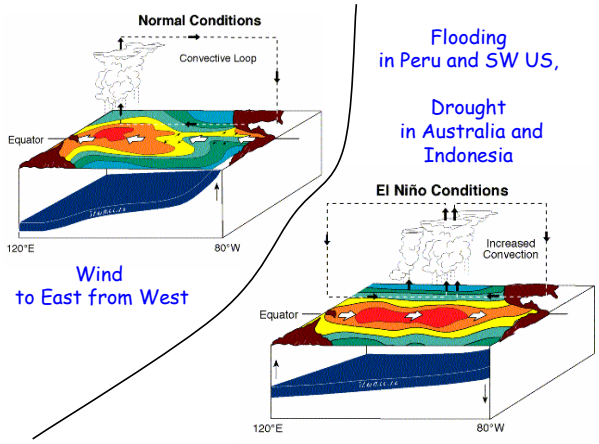
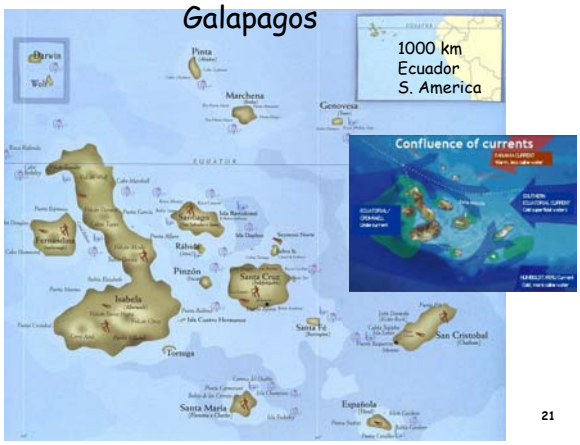


Galapagos



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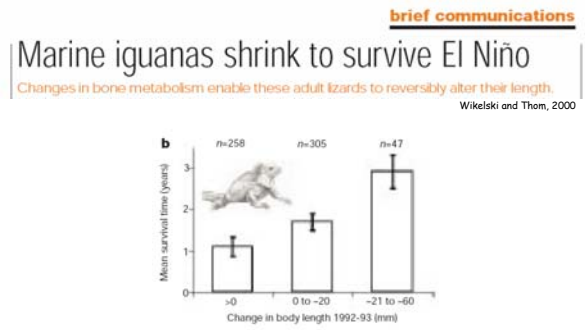

Why?

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Cold up-welling of Cromwell current brings _____ to western Galapagos.

Without it, much of the marine food web is lost...

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Galapagos Marine Iguana _____

Fernandina/Isabela (W)
males to 10+ kg
females to almost 3 kg

Genovesa (NE)
males only to 1 kg
females to < 1kg

Amblyrhynchus cristatus

Why?

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Iguanas bigger on some islands:

1. Water
2. Current strength
3. Food Availability

Males bigger than females:

_____ selection

What are sneaker males?

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Video clip about Galapagos and Marine Iguanas
Martin Wikelski with Alan Alda, etc.
Borrowed video from Angela

0-10 min	intro and general biogeography
10-18 min	~finches and beak evolution on Daphne Major
18-30 min	marine iguanas
30-39 min	nazca boobies and siblicide
39-52:40	conservation etc.

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Discovered 1530s

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Invasive Herbivores

Goats

No Goats

http://www.darwinfoundation.org/en/our-work/featured-projects/project-isabela

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Judas Goats on Isabela, Galapagos

http://www.darwinfoundation.org/en/our-work/featured-projects/project-isabela

Invasive Species Threaten Galapagos's Diversity, By Juliet Eilperin
Washington Post Staff Writer, Monday, February 27, 2006; A06

The eight-year battle to remove wild goats, donkeys and pigs from Santiago, Pinta and northern Isabela islands has cost at least $5.2 million and is still just shy of completion. The United Nations covered three-quarters of the cost.

The assault against feral goats -- along with an ongoing campaign against wild dogs, cats, pigs, donkeys and an array of invasive plants and insects -- demonstrates the challenge conservationists face in preserving this hotbed of genetic diversity. Alan Tye, interim director of sciences at the Charles Darwin Research Station on the island of Santa Cruz, said his institute focuses on just two things: "threats and threatened things."
Although 95 percent of the species that were here when humans first arrived still exist in the Galapagos, the International Union for Conservation of Nature and Natural Resources lists dozens on its "red list" of threatened species. These include the Galapagos hawk and the Galapagos fur seal, along with 57 species of Bulimulus snails.

Other species, including plants and insects, are harder to eradicate. At this point, the 720 introduced plants growing in the Galapagos outnumber the islands' 500 original plant species. Blackberry bushes, planted by farmers, have spread widely, along with quinine trees. Newer residents are bringing in ornamental shrubs such as lantana, nicknamed "the curse of India" because it drives out other plants, and other garden plants to the Galapagos.

Invasive Insects

Charles Darwin Research Station Fact Sheet

Eradication of fire ants

CDF FOCUS: RESTORATION

Key Facts
Species: Wasmannia auropunctata
Common name: Little fire ant
Origin: Central and South America
Class: Invasive
Impact: Affects native invertebrate populations and reptile and bird breeding
Range: Extensive, spread to eight islands and five islets
Action: Control and eradication

Species: Solenopsis geminata
Common name: Tropical fire ant
Origin: New World
Class: Invasive
Impact: similar to W. auropunctata
Range: Extensive, spread to six islands and five islets
Action: Control and eradication

Arrival in Galapagos

Impact on Galapagos

CDRS Research Activities

Invasive Plants

Charles Darwin Research Station Fact Sheet

Blackberry invasion

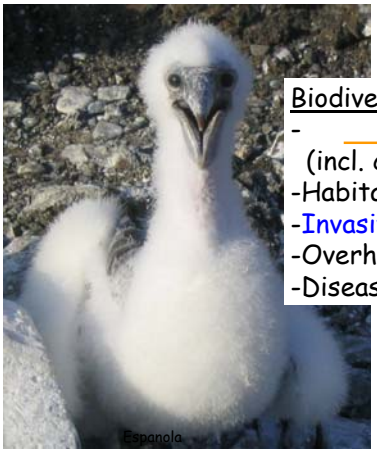
CDF FOCUS: RESTORATION

Key Facts
Family: Rosaceae
Species: Rubus niveus, R. glaucus, R. ulmifolius, R. adenotrichos, R. megalococcus
Common name: Blackberry, Mora
Class: Invasive
Impact: Replacing native and endemic vegetation, invading farmland
Origin: Asia (R. Niveus), Central to South America (R. glaucus, R. adenotrichos, R. megalococcus), Africa & Europe (R. ulmifolius)
Description: dense thickets up to 4m high
Range: San Cristóbal, Santiago, Santa Cruz, Isabela
Action: Eradication

Arrival in Galapagos

- *Rubus niveus*
- *Rubus glaucus*
- *Rubus ulmifolius*
- *Rubus adenotrichos*
- *Rubus megalococcus*

Impact on Galapagos



Biodiversity Threats
-
(incl. climate change)
-Habitat Fragmentation
-Invasive Species
-Overharvesting
-Disease

Galapagos Marine Ecology (ECOL 496O/596O)
Summer Session II: July 7-Aug 1, 2009

- Spend one month this summer in the Galapagos Islands, Ecuador!
- Visit seven of the most spectacular islands in the archipelago
- Do a service project with children at a local school and the Galapagos National Park
- Do a field ecology project and learn about Galapagos ecology and evolution
- Earn 3-6 units of graduate or undergraduate credit

For more information: www.eebweb.arizona.edu/courses/galapagos
Katrina Mangin, mangin@email.arizona.edu, 520-626-5076

Thanks for a Great 1/3 Semester

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