Evolution of Australian Biota Study Day
2013

Taronga Zoomobile session
Student Activities
Welcome to the Australian Biota Workshop!!

Today’s lesson is jam packed with information about some of Australia’s most amazing animals. We will cover lots of the Australian Biota syllabus points plus lots of other information you will need to have a good understanding of biology.

Some of the main points to have in mind are:

A) Humans only live a short amount of time - lots of the processes we are studying (ie evolution) take place over much larger timeframes

B) The world is a changing place - the continents move, the climate changes, the plants and animals respond to these changes continuously - its not a one directional change!

C) Fitness - the priorities of an animal are often different to those of a human. In biology, we consider the ability of an animal to produce successful offspring as the ultimate achievement. This is known as fitness.

Basic Vocabulary/Concepts:
1) Nocturnal, Diurnal, Crepuscular
2) Behavioral, Structural and physiological adaptations
3) Ectothermic, endothermic
4) Arid, temperate environments
5) Camouflage
6) Arboreal
7) Vertebrate animals - Fish, Amphibians, Reptiles, Birds and Mammals (Monotremes, Marsupials, Placental)

And lots more...
THE STORY SO FAR... 65 MYA the extinction of the dinosaurs made way for the ‘Age of Mammals’...

**Marsupials**

Image by Cody Pope (Virginia Opossum)

**Marsupial Fossil Record**
- **South America** - oldest fossils 70 mya
- **Antarctica** - some teeth and bone fossils found
- **Australia** - oldest fossils 55 mya

**Monotremes**

**Monotreme Fossil Record**
- **LR - Lightning Ridge**
  - Steropodon - 110 mya
  - Kollikodon - 110 mya
  - (very different teeth to later platypus-type animals)
- **R - Riversleigh**
  - Obdurodon - 15-20 mya
- **P - Patagonia**
  - Monotrematum - 65 mya
  - (modern tooth types)

**Placental Fossil Record**
Fossils indicate Placental mammals were also found in Southern Hemisphere, though these organisms died out early on. Successful Placental mammals are evolving in Laurasian continents at this time.

Syllabus ref. 8.5.1, Evidence for the rearrangement of crustal plates and continental drift indicates that Australia was once part an ancient super continent.

Syllabus ref. 8.5.1—fossils in common on Gondwanan continents,
KANGAROO EVOLUTION

55 Million Years Ago
Kangaroos split from last common ancestor. Australia is covered in rainforest and still connected to Antarctica

25 MYA
Northern Australia is still warm and wet and covered in rainforest. Kangaroo ancestors are arboreal and have possum-like features

20 MYA to present
Musky Rat Kangaroos evolved 20MYA but still live in remnant areas of rainforest in Northern QLD (living fossil)

Features:

20-15 MYA
Southern Australia is dominated by savannah/open woodland. Huge radiation of kangaroo species in this time. The first megafauna appear

5-3 MYA
Rainforests return to large areas of northern Australia & PNG - some species of Kangaroo return to an arboreal existence—Tree Kangaroos

8 MYA
Arid areas increasing as polar ice caps increase. Hopping Kangaroo species dominate the forest floor

4-2 MYA
Southern Australia experiences larger arid areas than present due to glaciations. The beginning of modern kangaroo evolution. Reds appear at 2 mya

100 000—20 000 years ago
This is a period of rapid temperature change and therefore rapid plant and animal evolution. Evolution and extinctions of many megafauna species

Present Day
There are now over 60 species of Macropods in Australia. Red Kangaroos are one of the most successful species in Australia

Features:

Syllabus 8.5.4—gather, process and analyse information from secondary sources and use available evidence to propose reasons for the evolution, survival and extinction of species, with reference to specific Australian species

Features:
The Evolution of Kangaroos of Australia

Musky rat kangaroo – a living fossil

Can’t hop

Live in ancient rainforests

Semi-opposable toe

Semi-prehensile tail
Misky rat kangaroo – a living fossil
Tree Kangaroos

Lumholtz’s Tree Kangaroo

Bennett’s Tree Kangaroo
KANGAROO EVOLUTION

Red Kangaroos are an extraordinarily successful species. Give some reasons for their success, and describe some of their adaptations.

Red Kangaroos are a relatively new species, but have had a long evolutionary path. Using your knowledge of the ancestral body type, provide reasons for the changes we can see to their body shape and dentition.

It is estimated that there are 10-100 million species of living things on Earth, but that billions of species have already become extinct. Propose reasons why some species survive longer than others, and why some species go extinct. (Like the early placental mammal in Australia!)

Syllabus 8.5.4 - Gather, process and analyse information from secondary sources and use available evidence to propose reasons for the evolution, survival and extinction of species, with reference to specific Australian species.

Illustrations - Australian Geographic
**FERTILISATION AND SURVIVAL OF YOUNG IN AUSTRALIAN FAUNA**

*Australian Pythons*

**What features or behaviours do Pythons have that help ensure fertilization of their eggs?**

**What features or behaviours do Pythons have that help ensure their young survive?**

**Notes** - Reptiles have colonised land successfully by adapting to a dry environment. They have done this by carrying out internal fertilisation, and allowing their young to develop inside a waterproof egg to avoid desiccation or predation. (Sexual reproduction also produces offspring that are genetically different and possibly better adapted to new and changing environmental conditions than their parents. This gives the species a better chance at surviving in ever-changing environments).
Shingleback lizards are able to live in both temperate and arid environments. To be able to do this they have adaptations suited to both. Can you work out which features enable them to survive in a temperate environment, and which are for survival in an arid region?

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<th>Temperate Adaptations</th>
<th>Arid Adaptations</th>
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Australia already has one of the highest extinction rates of flora and fauna in the world, and Global Warming is set to push even more species to extinction. Do you think shinglebackss will become extinct soon? Why/why not? Briefly explain why some species are more likely than others to become extinct due to climate change.
Echidnas show enormous variation within their species. As conditions change across their range, individuals display different variations.

Can you work out which one of these is more likely to be found in a temperate environment, and which one would be more likely to be found in an arid region? What features/adaptations indicated this to you?

**Temperate Adaptations:**

**Arid Adaptations:**

Australia already has one of the highest extinction rates of flora and fauna in the world, and Global Warming is set to push even more species to extinction. Do you think echidnas will become extinct soon? Why/why not? Briefly explain why some species are more likely than others to become extinct due to climate change.