

Monday, 03 February 2014

Biodiversity

Biodiversity

- Species diversity: the number of different species and the number of individuals of each species within any one community.
- Genetic diversity: the variety of genes possessed by individuals that make up any one species
- Ecosystem diversity: the range of different habitats within a particular area

Species Diversity

- Can be used to measure biodiversity
- Two components:
 - Number of different species in a given area
 - The proportion of the community that is made up of an individual species

A wide-angle photograph of a vast agricultural field. The foreground and middle ground are filled with neat, parallel rows of young, vibrant green plants, likely a vegetable or crop field. The rows recede into the distance, creating a strong sense of perspective. In the far distance, several small figures of people can be seen working in the field. The sky is a pale, clear blue, and the overall scene is bright and open, representing a typical agricultural landscape.

The impact of agriculture

Impact of agriculture

- Natural ecosystems develop from complex communities
- Agricultural ecosystems are carefully controlled by humans

- Farmers select crops that are more productive.

- The frequency of alleles is reduced

- For economic reasons, the crop yield needs to be large.

- Any one area can only support a certain amount of biomass – if most of this area is taken up by a crop, then there is little area left for anything else

- Crops are sprayed with pesticide and man made fertiliser.
- This further disadvantages and excludes species that the farmer does not want
- This all acts to reduce species diversity



Impact of deforestation



Impact of deforestation

- Forests contain many varied and different habitats = high species diversity
- Permanent clearing of the forest leads to loss of habitats and in turn loss of biodiversity
- What might you want to clear a forest for?

Most Biodiverse Places on Earth?



The background features several stylized question marks in various colors (green, purple, pink, blue) with decorative swirls extending from their stems. The text is centered and reads:

**What are
evolution and
natural selection?**

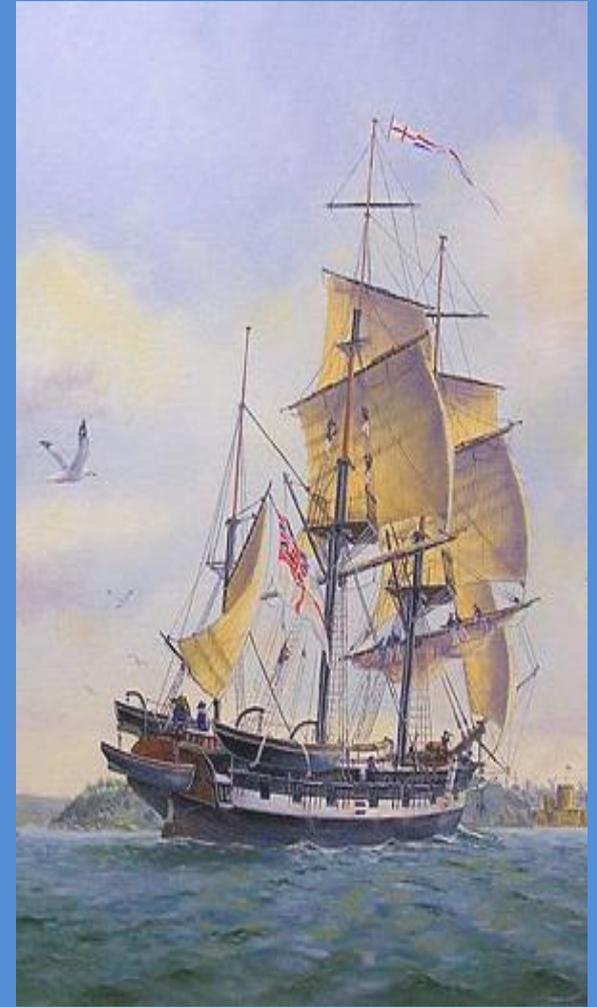
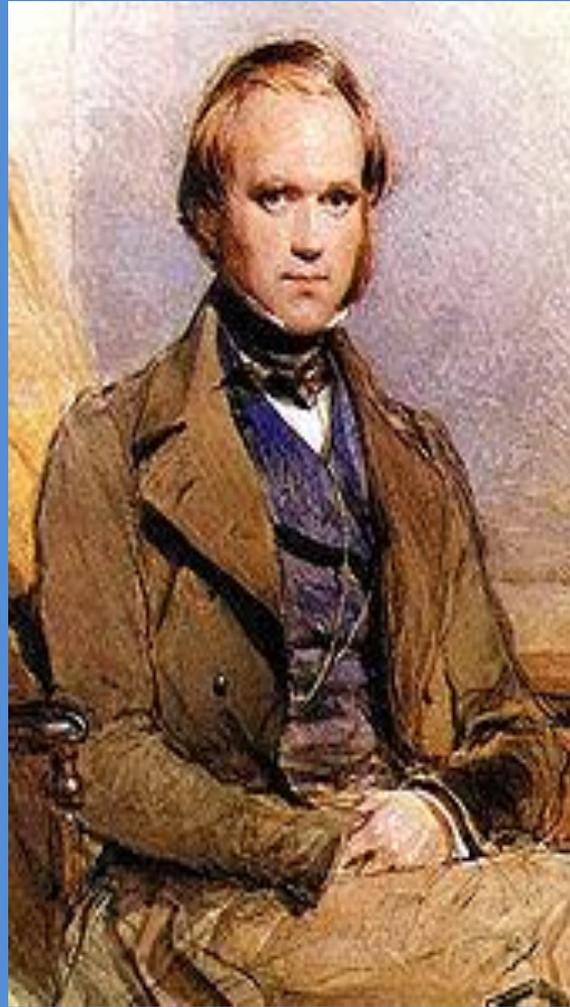
EVOLUTION : Gradual change in the range of organisms on the Earth. New species continually arise from species that already exist, and other species become extinct.

NATURAL SELECTION :

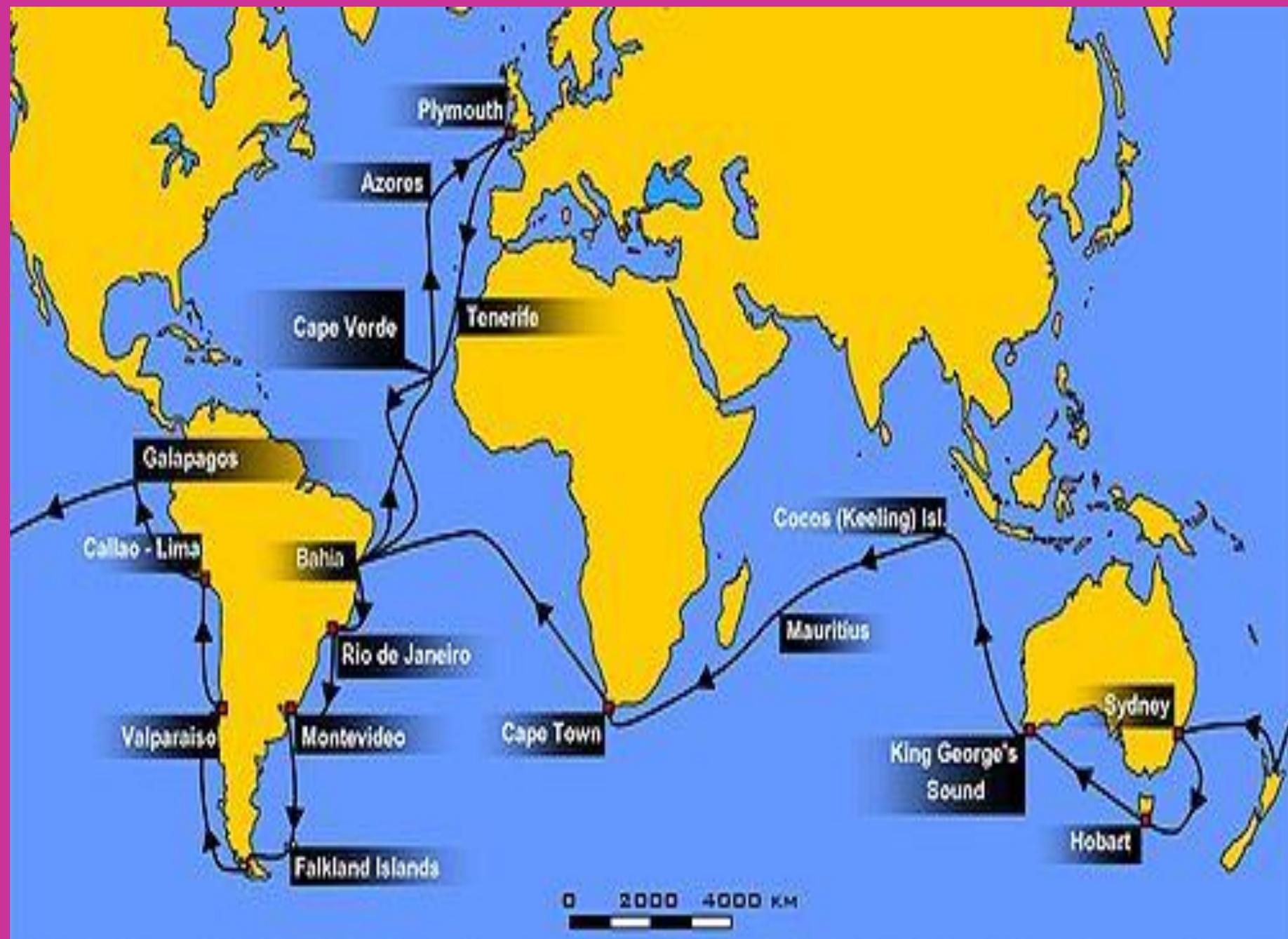
mechanism by which new species arise. Organisms produce more offspring than the environment can support. Only those best adapted to their environment will survive to breed and pass on their characteristics.

**Who was
Darwin?**



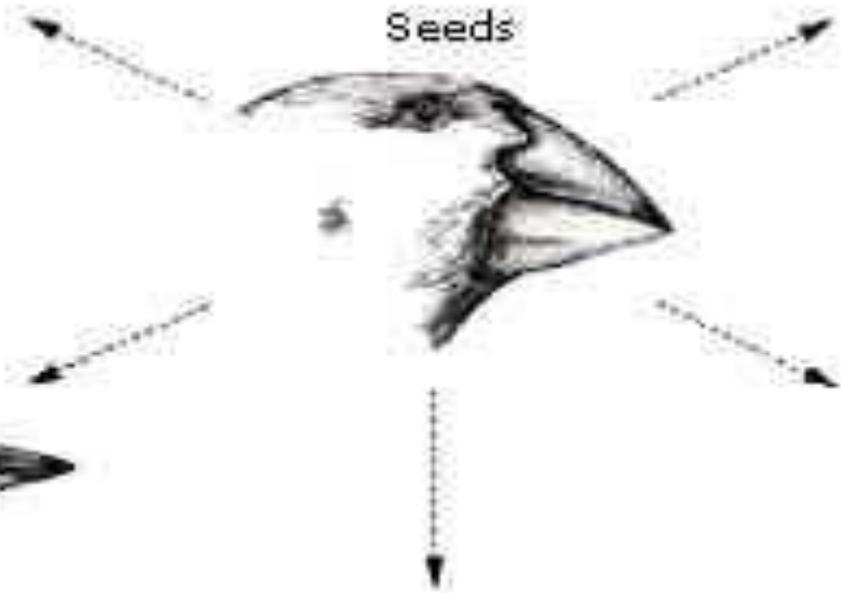
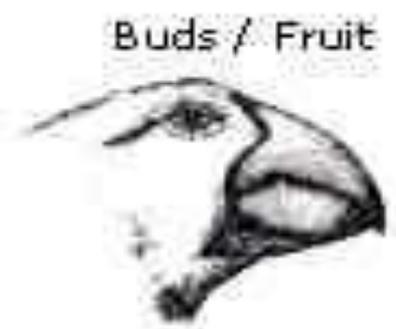


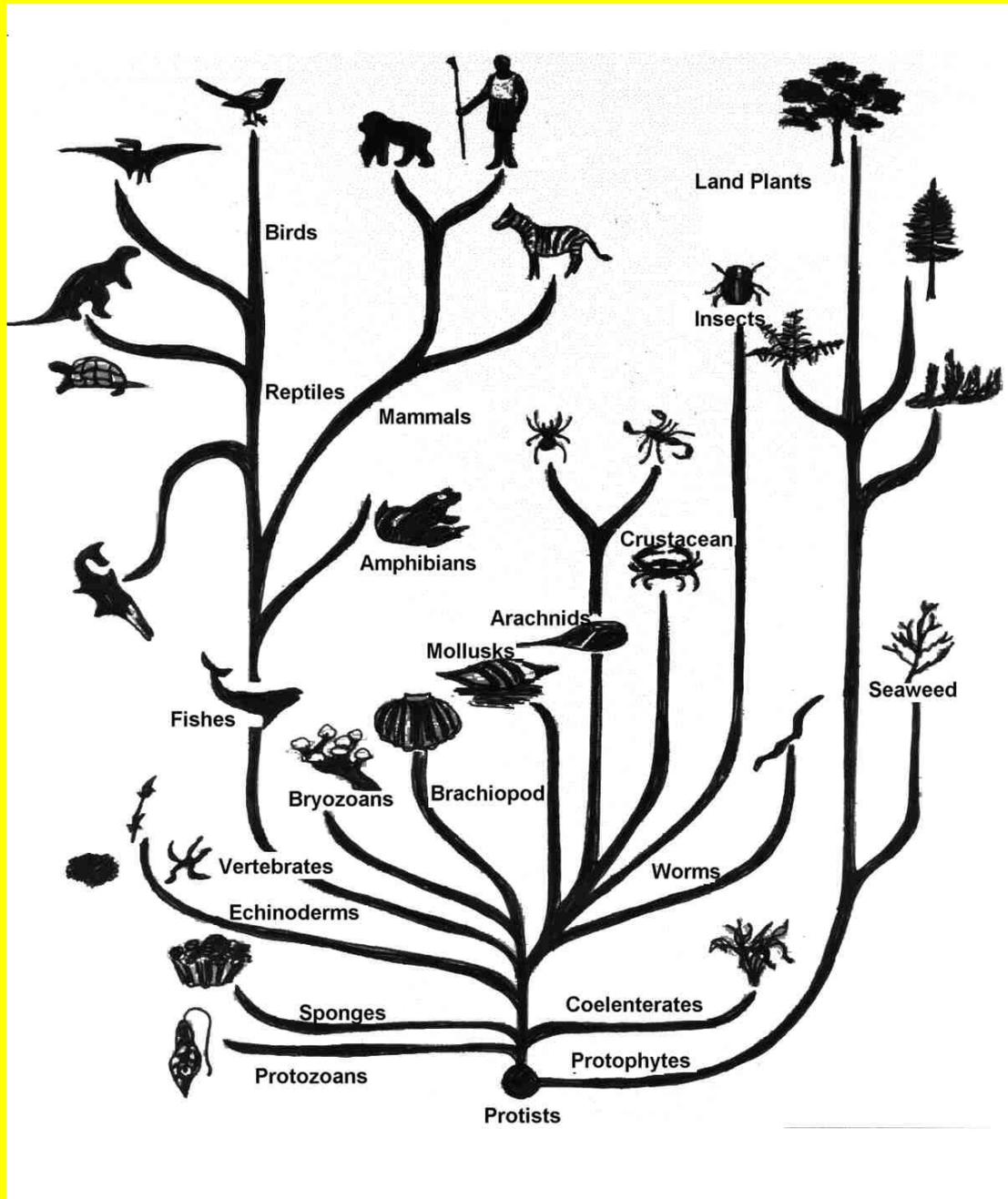
**“You’re good for nothing but shooting guns and rat-catching
... you’ll be a disgrace to yourself and all your family”**



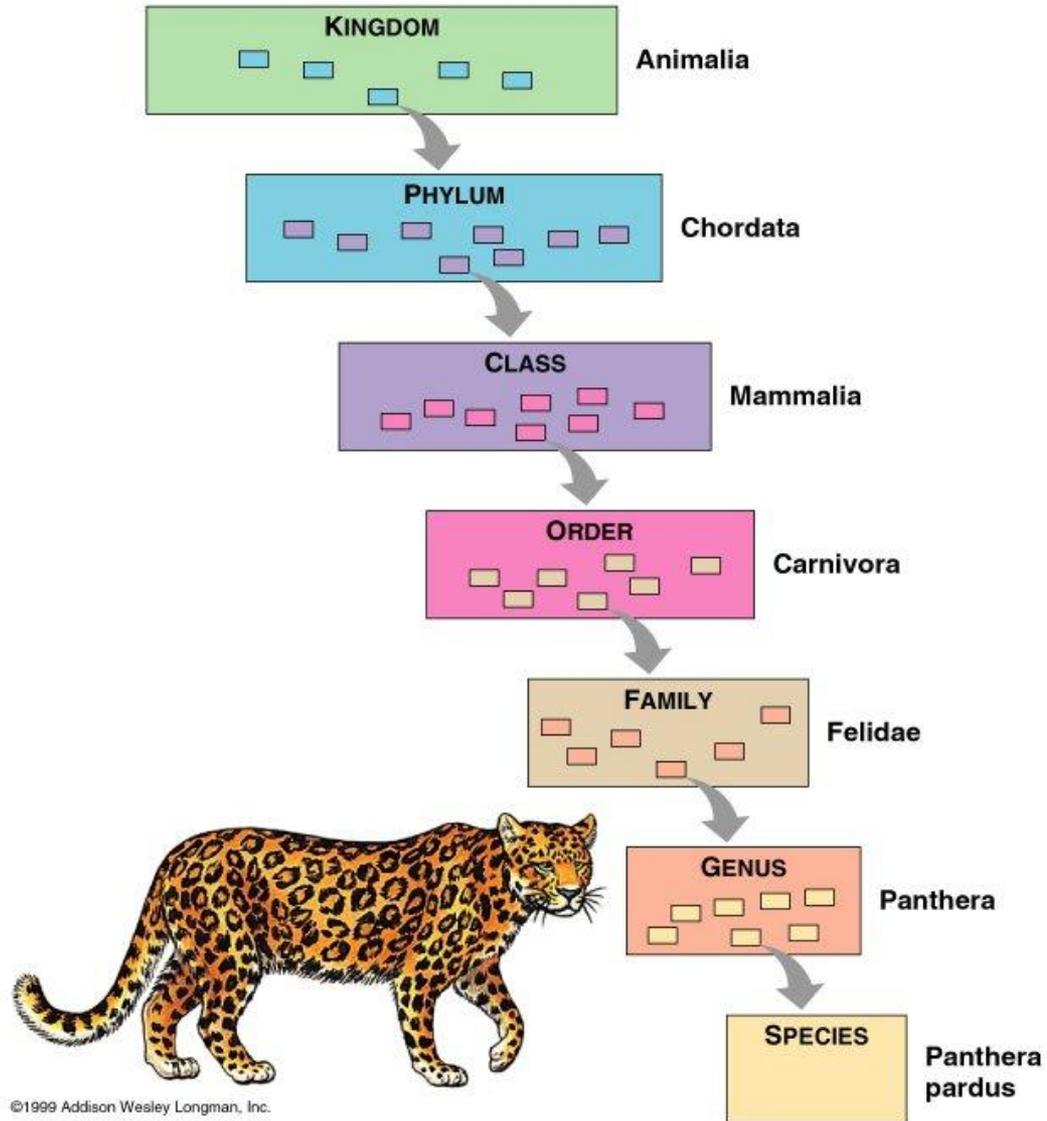
Darwin's Finches

ADAPTIVE RADIATION





Classification



Answers to task...

- **Prokaryotae** (unicellular, microscopic, no internal membrane based organelles, no nuclear membrane, cell wall not cellulose);
- **Protoctista** (eukaryotes, mainly single cell organisms, no tissue differentiation);
- **Plantae** (multicellular eukaryotes, photosynthetic, cellulose cell wall);
- **Fungi** (heterotrophic eukaryotes, rigid cell walls of chitin, reproduce by spores);
- **Animalia** (heterotrophic, multicellular eukaryotes, no cell wall, nervous coordination).

Animal Phyla



Annelids

earthworm, leech, and lugworm.

Segmented worms with a closed circulatory system, hydrostatic skeleton; specialised segments responsible for different functions, thin permeable skin used for gas exchange.

Arthropods

- insects e.g. locust, crustaceans e.g. lobster, arachnids e.g. spider, myriapods e.g. millipedes and centipedes. These organisms are characterised by having jointed legs, an exoskeleton, and a fluid-filled body cavity. The advantages of the exoskeleton. Insects are the most successful group of animals on Earth. The presence of two pairs of wings and six legs in the adult stage is a diagnostic feature of the insects. (In the evolution of some insect groups these features may have been secondarily lost, e.g. no wings in fleas and lice.)

Chordates

Known as 'vertebrates', possessing a vertebral column or backbone (no use of term 'notochord'), well developed CNS enclosed in cranium, internal skeleton. Phylum subdivided into: fish (scales, gills, live in water), amphibian (soft moist skin, simple lungs, live on land but water needed for life cycle), reptiles (dry scaly skin, lungs, land based, lay eggs with leathery shells), birds (endothermic, lungs, feathers, forelimbs modified for flight, eggs with hard shells), mammals (endothermic, lungs, hair, double circulation, internal gestation and mammary glands, sweat glands).

Answers to task 2...

- **Annelids** (8000 named species) examples - earthworm, leech, and lugworm. Segmented worms with a closed circulatory system, hydrostatic skeleton; specialised segments responsible for different functions, thin permeable skin used for gas exchange.
- **Arthropods** (1 million named species) examples – insects e.g. locust, crustaceans e.g. lobster, arachnids e.g. spider, myriapods e.g. millipedes and centipedes. These organisms are characterised by having jointed legs, an exoskeleton, and a fluid-filled body cavity. The advantages of the exoskeleton. Insects are the most successful group of animals on Earth. The presence of two pairs of wings and six legs in the adult stage is a diagnostic feature of the insects. (In the evolution of some insect groups these features may have been secondarily lost, e.g. no wings in fleas and lice.)
- **Chordates** (60,000 named species). Known as ‘vertebrates’, possessing a vertebral column or backbone (no use of term ‘notochord’), well developed CNS enclosed in cranium, internal skeleton. Phylum subdivided into: fish (scales, gills, live in water), amphibian (soft moist skin, simple lungs, live on land but water needed for life cycle), reptiles (dry scaly skin, lungs, land based, lay eggs with leathery shells), birds (endothermic, lungs, feathers, forelimbs modified for flight, eggs with hard shells), mammals (endothermic, lungs, hair, double circulation, internal gestation and mammary glands, sweat glands).

How do we recognise closely related species?



So...



Compare DNA or Proteins



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Classification

What is a species?

How are species named?

What are the principles of classification?

How is classification related to evolution?

What is classification?

- ◆ Organising living organisms into groups
- ◆ We need to do this as scientists have already named around 1.8 million different living organisms

What is a species?

<http://www.dulops.net/seresvivos>



What is a species?

- ◆ A group of organisms that are similar to each other but different from members of other species.
- ◆ Similar genes, similar physical and biochemical characteristics
- ◆ Similar developmental patterns and immunological features
- ◆ Occupy the same *niche*

The Binomial System

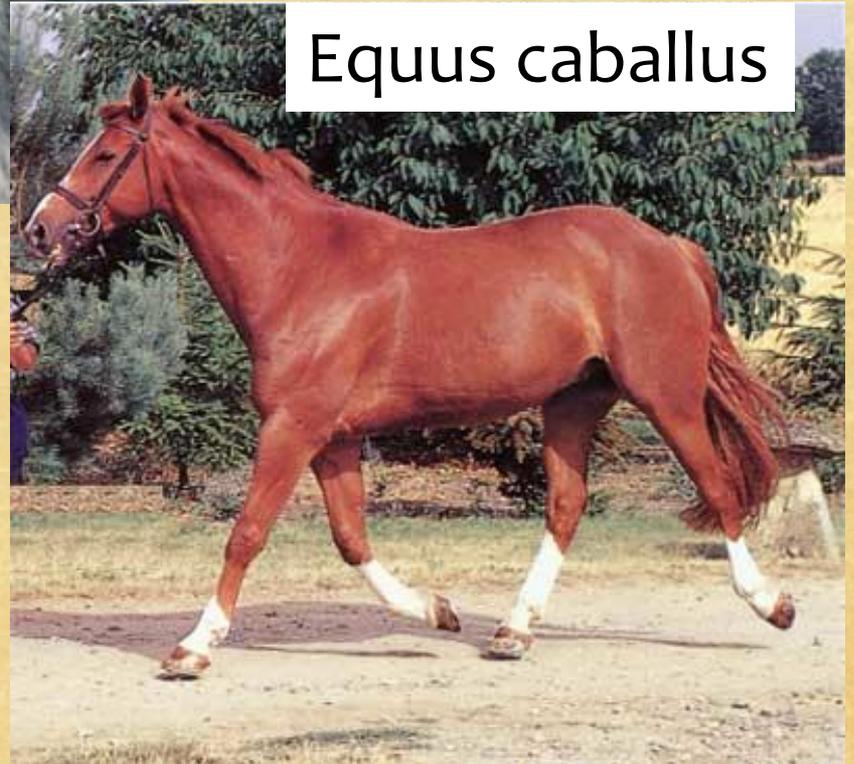
- ◆ Uses Latin or Greek names
- ◆ The first name is the *generic name* and this is the Genus to which the organism belongs
 - ◆ (Similar to the surname of a person)
- ◆ The second name is the *specific name* and this is the species.
 - ◆ (Similar to the first name of a person)



Canis lupus



Protea caffra



Equus caballus

The Binomial System: Rules

- ◆ The specific name is *never* shared with another species within the genus.
- ◆ The names are printed in italics or underlined if hand written
- ◆ The first letter of the generic name is capitalised, and the specific name is not

Problems defining species...

- ◆ What should you do about different breeds of dog?
- ◆ Species are not fixed
- ◆ Many species are extinct
- ◆ Some species are sterile...

The mule problem...



The mule problem...

- ◆ A mule is the produce of a horse and a donkey mating
- ◆ As horses and donkeys are different species, a mule is sterile
- ◆ They have 63 chromosomes – 32 from the horse and 31 from the donkey
- ◆ As the number of chromosomes is odd, meiosis cannot form gametes

The mule problem...



Am I a
distinct
species?