

Classification

Classification

All species on earth are given a scientific classification.

- Why do scientists classify?

Purposes of Classification

- Common **names** are not reliable. For Example: the “Christmas beetle” of one area may be a very different insect from the “Christmas beetle” of another.
- Each species has only one correct scientific name but it may have several common names.
- Scientific names are uniform across the world.
- Scientific names indicate evolutionary relationships between species.

Some venomous snakes from around Victoria





These are all tiger snakes (*Notechis scutatus*)

Two different classification systems

What are the five different kingdoms
of organisms that are generally
recognized by scientists today?

Or

The Three Domains

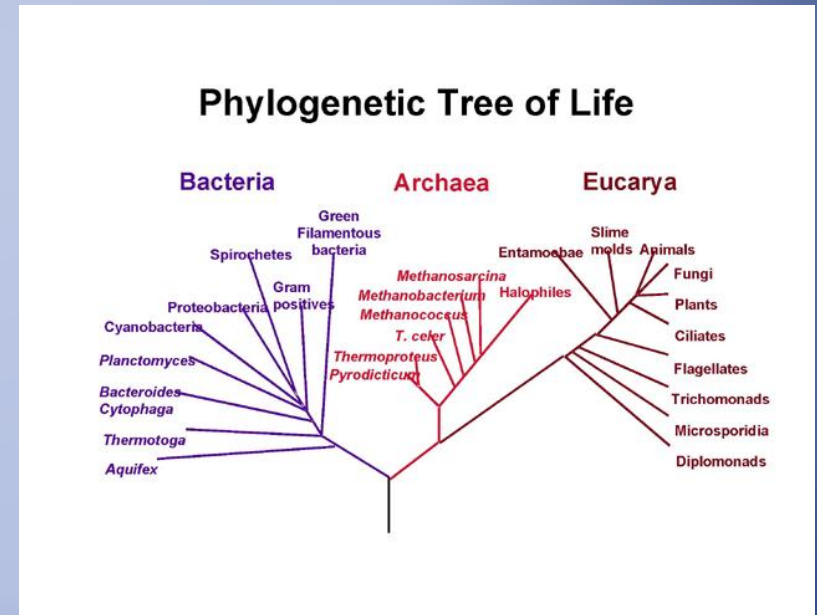
Let's start with the new system

- The Three Domains

The Three Domains

The Domains were developed in 1996 using DNA sequencing. They are a new way of classifying organisms.

- Bacteria - prokaryotes
- Archea – very old prokaryotes
- Eukarya - eukaryotes



1. Bacteria



- prokaryotes , microscopically small, mostly single celled and fundamentally different from all other organisms.
- Have a very diverse metabolism (cell chemistry)
- Survive in a great range of habitats and conditions.
- They include the only known organisms to ‘fix’ atmospheric nitrogen into a form that other organisms can use.
- Cause a wide variety of diseases.
- Used by humans to manufacture food and medicine.

2. Archaea

- Very old bacteria thought to belong to the bacteria but phylogenically different.
- Halophiles (salty environments)
- Methanogens (use hydrogen gas and CO_2 to generate the energy needed to make sugars, releasing methane gas in the process)
- Thermophiles (high temperature environments)



3. Eukarya

- Discovered by using modern molecular technology to compare the DNA of different groups of bacteria and other organisms.
- All the other kingdoms grouped together i.e. protists, plants, fungi and animals.
- Recognises the common trait that all other eukaryotic groups share – nuclei and internal membranes.

The Five Kingdoms

- What is the difference between morphological and Biochemical differences.
- As a result species get moved around. Take chimpanzee.

The five Kingdoms (Taxonomic groups)

- Kingdom Monera or Prokaryotae (prokaryotes, all bacteria)
- Kingdom Protista (mostly unicellular, eukaryotes).
- Kingdom Plantae (plants, eukaryotes)
- Kingdom Fungi (fungi, eukaryotes)
- Kingdom Animalia (animals, eukaryotes)

Before we start lets look at some
terminology

Bionomial System

- When the scientific name of a species is written, the last two levels of classification are given. i.e. the genus and species name. This is known as the binomial system and was first proposed by Linnaeus.
- Developed in the 18th century by Swedish botanist Carl von Linne (1707-1778).
- A generic (or genus) and a specific descriptive name
- eg: *Apis mellifera* or *A.melliferra* (short) is how we refer to a species of honey bee.
- We also use common names eg. 'magpie'

Some points worth noting.

1. Scientific names are usually written in italics or underlined.
2. Scientific names are latinised and their literal meaning should describe the species in some way.

For Example: Red-headed honeyeater

Myzomela erythrocephala

Myzomela to suck honey *erythrocephala* red-headed

3. The first letter of the genus is capitalised and the species name (descriptor) is written in lower case.

Bactrian Camel



Camelus bactrianus

Dromedary Camel



Camelus dromedarius

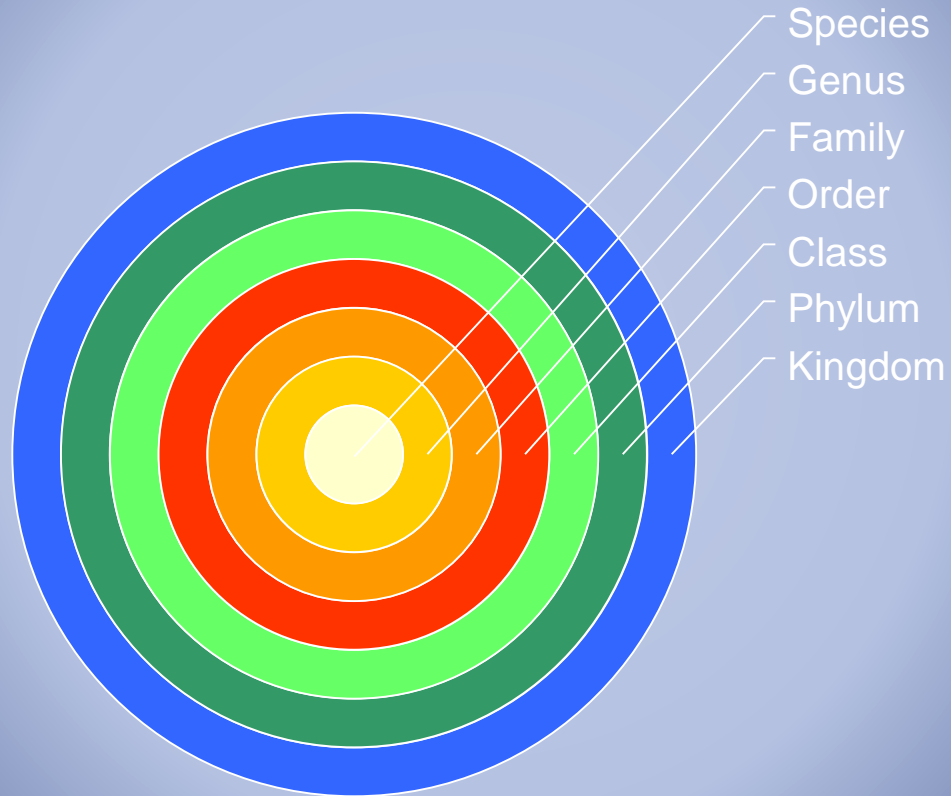
Stick Insect



Extatosoma tiaratum

Grouping

Organisms are grouped by their shared characteristics.



Mosquitoes are a common pest in Australia where there are well over 250 named species. Mosquitoes are responsible for spreading a large number of different diseases. Millions of these miniature dirty syringes go from person to person and animal to person, cross infecting with worms, protozoa and viruses. Dozens of illnesses affecting animals and people include malaria, dengue & Ross River fever, myxomatosis and dog heartworm are spread by mosquitoes.

Mosquitoes vary from species to species but have the following in common.

- They lay their eggs in or near water.*
- Only the females take a blood meal. The males get by on plant nectar.*
- The adults fly.*





Mosquito that transports
the virus causing dengue
fever



Mosquito that transports
Barmah Forest virus



*Rests and feeds
with body parallel
to surface*



*Rests and feeds
with body parallel
to surface*



*Note how this genus
angles body when
resting and feeding
(Quick identification)*

There are 3 common genera of mosquito represented here, *Anopheles*, *Aedes* and *Culex*.

(Genera is plural of genus)

Levels of Classification

1. Kingdom

2. Phylum

3. Class

4. Order

5. Family

6. Genus

7. Species



Most diverse

Least diverse

	Human	Dog
Kingdom	Animalia	Animalia
Phylum	Chordata	Chordata
Class	Mammalia	Mammalia
Order	Primates	Carnivora
Family	Hominidae	Canidae
Genus	Homo	Canis
Species	sapiens	familiaris

	Budgerigar	River Red Gum
Kingdom	Animalia	Plantae
Phylum	Chordata	Tracheophyta
Class	Aves	Angiospermae
Order	Psittaciformes	Myrtales
Family	Psittacidae	Myrtaceae
Genus	Melopsittacus	Eucalyptus
Species	undulatus	camaldulensis

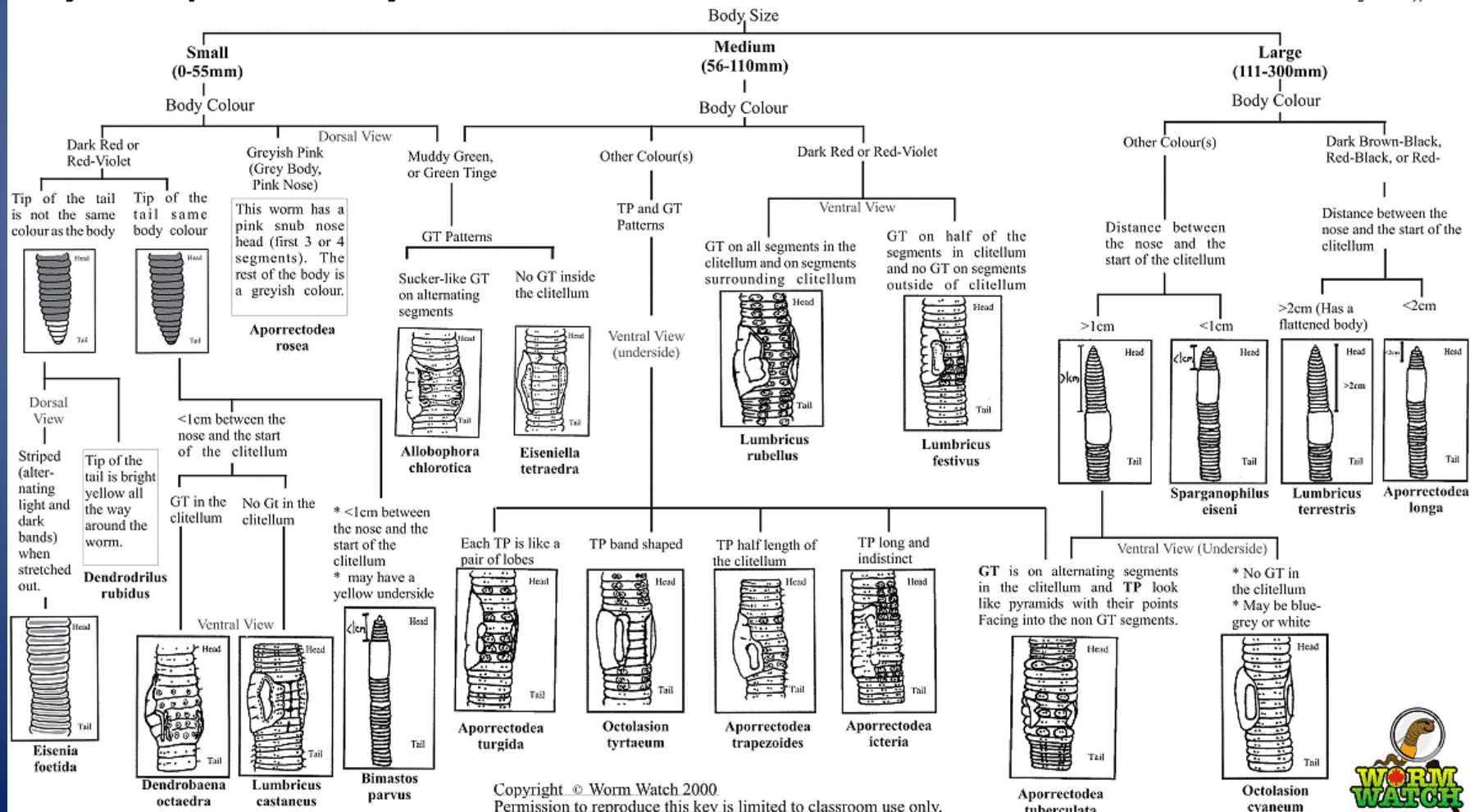
Kingdom	Region of world	Pacific
Phylum	Country	Australia
Class	State	Victoria
Order	City	Melbourne
Family	Suburb	Essendon
Genus	Street	Puckle St
Species	Street Number	216

How do biologists identify an unknown species??

One important way is the use of a taxonomic key.

Key to Reproductively Mature Earthworms Found in Canada

(an earthworm without a clitellum is not reproductively mature and thus cannot be identified using this key)

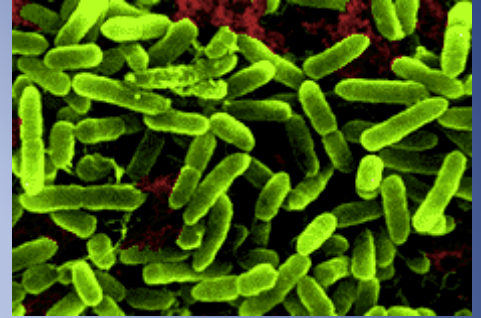


The five Kingdoms

- Kingdom Monera or Prokaryotae (prokaryotes, all bacteria)
- Kingdom Protista (mostly unicellular, eukaryotes).
- Kingdom Plantae (, eukaryotes)
- Kingdom Fungi (fungi, eukaryotes)
- Kingdom Animalia (animals, eukaryotes)

1. Kingdom Monera/Prokaryotae ("Monerans")

- Smallest and simplest lifeforms
- Unicellular (one-celled)
- no nucleus
- Bacteria
 - Three basic shapes:
 - round (cocci)
 - rod (bacilli)
 - spiral (spirilli)



Cyanobacteria– ‘blue green algae’, resemble plants in that they contain chlorophyll.

2. Kingdom Protista(“Protists”)

- Single-celled or multicellular
- more complex than organisms in Kingdom Monera
- Nucleus, (eukaryotic)
- Most a free living
- Some are important parasites that cause diseases.

Protozoa (animal-like)

- no cell wall or chlorophyll
- internal digestion
- no locomotion (some)

Algae (plant-like)

- Cell walls
- Chlorophyll
- autotrophic
- Placed in groups according to color and structure



3. Kingdom Fungi

- Multicellular; complex
- cell walls, no chlorophyll
- Heterotrophs
- Immobile
- Reproduction by spores

Some groups are

- Threadlike fungi (bread mold)
- club fungi (mushrooms)
- sac fungi (yeast and mildew)



4. Kingdom Plantae

- Multicellular, cell walls made of cellulose, chlorophyll and store food in form of starch
- Largest and longest-living things on Earth
- Restricted to moist terrestrial environment.



Subdivided into 2 major groups according to tissue structure

Vascular

- CAN conduct water
- Capable of living in drier areas
- Club mosses, Ferns, Horsetails, Gymnosperms, and Angiosperms

OR

Nonvascular

- CANNOT conduct water
- Example: Moss
- Moist environment

- See page 224

Non-Vascular Plants

Phylum: Bryophyta

- Lack transport tissue (i.e. no xylem and phloem vessels)
- They are small and restricted to moist terrestrial environment
- Do not possess true roots, stems or leaves.
- Examples: liverworts and mosses

Vascular Plants

- Vascular plants are divided into two groups:
 - Seedless plants
 - Seed plants

Seedless vascular plants

- Phylum: Lycophyta
 - Club mosses
- Phylum: Sphenophyta
 - Horsetails
- Phylum: Filicinophyta
 - Ferns

Seed vascular plants

- Can be further divided into two groups
 - Gymnosperm
 - Lack enclosed chambers in which seeds develop
 - Produce seeds in cones which are exposed to the environment
 - Angiosperms
 - Seeds in specialised reproductive structures called flowers
 - Female reproductive ovary develops into a fruit
 - Pollination usually via wind or animals

Gymnosperms

- Phylum: Cycadophyta
 - cycads
- Phylum: Ginkophyta
 - Ginko
- Phylum: Coniferophyta
 - Conifers

Angiosperms

- Phylum: Angiospermophyta
 - Can be subdivided into 2 classes
 - Class: Monocotyledoneae (Monocots)
 - Lilies, grasses, bamboo, daffodils....
 - Class: Dicotyledoneae (Dicots)
 - Trees, shrubs and many annuals....

5. Kingdom Animalia

- Divided into invertebrates and vertebrates.
- Invertebrates have NO backbone, vertebrates DO!
- These can be broken down into sub kingdoms



Invertebrates

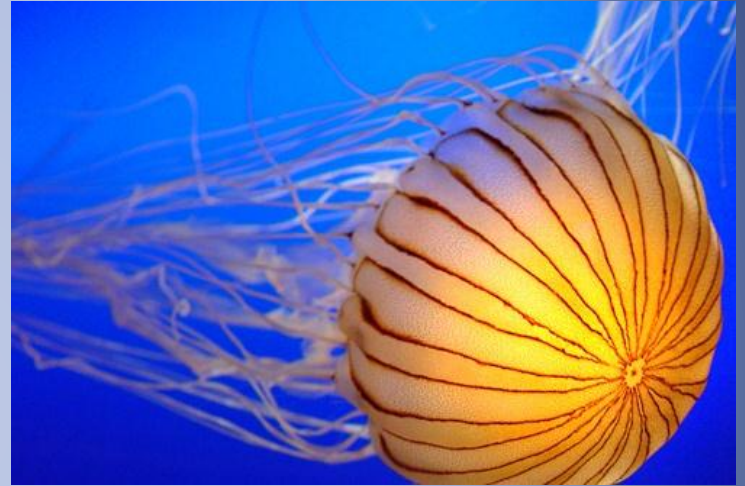
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Phylum: Porifera (Sponges)

- Simplest of the animal groups
- lives in salt water attached to the bottom
- Hollow central cavity
- Two layers of body cells with tiny pores
- All aquatic
- Examples: tube sponge...

Phylum: Cnidaria (jellyfishes)

- two cell layers
- All are aquatic (mostly marine)
- hollow body with a single opening
- 2 body forms-medusa and polyp
- Examples: Jellyfish, hydras, and corals



Phylum: Platyhelminthes (Flatworms)

- Flattened body
- Many are parasitic
- one body opening (mouth but no anus)
- two eyespots (light detection)
- Examples: tapeworm, planarians, flukes



Phylum: Nematoda (Round worms)

- Tiny unsegmented worms
- Examples: Hookworms, stomach worms, lung worms, filarial worms

Phylum: Annelida (Segmented Worms)

- Rounded, segmented bodies
- two body openings
- has five hearts and a brain
- Examples: leeches, earthworms, marine tube worms...



Phylum: Mollusca (Mollusks)

- Soft-bodies, no shell: (octopus/squid)
- Unsegmented
- Body compromises of head, muscular foot and visceral mass
- well-developed organs
- With shells: clams/oysters)
- Some have lost shells: octopus, slugs.
- Examples: snails, muscles, squid, octopus...



Phylum: Arthropoda (Arthropods)

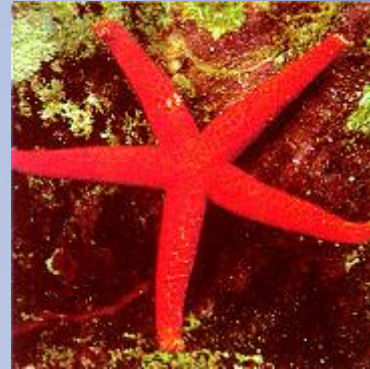
- Largest group of animals
- multiple body segments
- jointed appendages (legs/arms)
- exoskeleton (hard outer covering)
- Well-developed organs
- Examples
 - Class: Crustacea (shrimp, crab...)
 - Class: Arachnida (spider, scorpion...)
 - Class: Insecta (honey bee, butterfly...)
 - Class: Diplopoda (millipedes, centipedes...)



Some classes of arthropods:

Phylum: Echinodermata (Echinoderms)

- Spiny skinned animals
- flexible arms; tube feet
- known for regeneration (ability to grow new body parts)
- Examples: star fish, sand dollars, sea cucumbers



Vertebrates

- All vertebrates belong to phylum Chordata
- All have backbones (though some are cartilage most are bone)
- body with a head and most have appendages
- endoskeleton (internal skeleton for support/protection)

Can be

- Ectotherm (cold-blooded); body temperature changes with the environment
- Endotherms (warm blooded); body temperature set at a certain temperature.

- See page 227

Phylum : Chordata

Class: Chondrichthyes (Cartilaginous Fishes)

- ectotherms
- Two pairs of fins; gills
- strong teeth (sharks)
- SKELETON MADE OF CARTILAGE
- Examples: stingrays, skates, sharks



Class: Osteichthyes (Bony fishes)

- ectotherms
- Gills and operculum (bony flap over gills)
- streamlined bodies (narrow shape)
- Fins and scales
- most numerous group of fish
- Examples: Flounder, eels, trout, sea horses...



Class: Amphibia (Amphibians)

- ectotherms
- part of their life is spent on land and part of life is spent in the water
- Undergo metamorphosis into an adult
- smooth, moist skin (not scaly)
- gills when they are young and have lungs as adults
- Example: Frogs, toads, salamanders, newts...



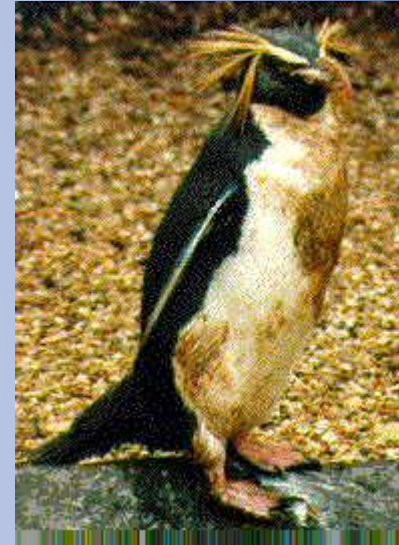
Class: Reptilia (Reptiles)

- Ectotherms
- Adapted to live on land (terrestrial)
- breathe with lungs
- body covered with plates or scales
- lay eggs in a leathery shell
- Examples: turtles, snakes, lizards, crocodiles, and alligators



Class: Aves (Birds)

- endotherms
- Bodies adapted for flight (light, bones, feathers, and wings)
- Scaly legs and feet
- lay eggs in a hard shell
- Examples: penguins, emus, magpies, sparrows....



Class: Mammalia (Mammals)

- Endotherms
- Advanced nervous system; highly developed brain
- Hairy bodies
- can occupy several habitats
- give birth to live young;
- produce milk mammary glands
- Can be grouped into Monotremes, Marsupials and Placentals
- Examples: echidna, kangaroo , tiger, humans....

Summarise

- Complete the table summary outlining the main features.