

ADELAIDE
ZOO



Classification: sorting animals



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Acknowledgements

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For the Teacher

General Information

Welcome to Adelaide Zoo!

The Zoo is a great place for learning. Adelaide Zoo Education aims to support student learning by providing resources to assist classes to have educational and enjoyable experiences at the Zoo.

This booklet will provide a range of activities which may be undertaken by your students during their visit to the Zoo. A map and suggested order of activities is provided to give a logical circuit to travel during the visit.

Animal species change from time to time, and sometimes animals are “off limits” or out of sight during visits, so a flexible approach to completion of activities is recommended.

In planning, please consider whether

- ◆ you would like your class to regroup for lunch, animal feeds, the Discovery Zone or at the Entrance at the end of the visit. If so, relay the times and meeting places to students or supervisors (in writing if possible.)
- ◆ you would like to see the Pandas or use the Nocturnal House: if so, book a time when making the Zoo booking so your students are not disturbed by other school groups.
- ◆ you would like a session with a Zoo Education Officer to support your study theme. Lesson requests are met wherever possible, though at busy times of the year you may need to have a few options with dates to enable a time to be negotiated. Again, this time is arranged at the time of booking your class visit.

If your class is not booked in to a program involving an Education Officer, we will attempt to meet your class at the Entrance on arrival at the Zoo. At this meeting the group will be welcomed and given some information about the Zoo to assist their visit. General behaviour expectations will also be outlined.

Specific information relating to this Zoo Trail will follow for the teachers and for adult supervisors. Please ensure that supervisors have a copy of the relevant pages **before they come to the Zoo** so they can also be mentally prepared to maximise the learning for the students in their care.

Classification trail – Lower Secondary

TEACHER INFORMATION

This trail is aimed at increasing students' understanding of the systematic organisation of living things. This includes

- Practical reasons for classifying organisms.
- The use of structural features in this process.
- The scientific literacy involved in the classification process.
- The understanding of what a “species” is.
- Knowing that there are difficulties, “grey areas” and disagreements amongst scientists about classification of organisms, and that classification is a fluid process which changes as people learn more about species.

The booklet is designed for completion by groups of 2 - 4 students. Some of the activities require deep thinking and broad general knowledge, and this is more achievable in a group situation. Teamwork in navigation, organisation and writing will also add to students' involvement, learning and enjoyment of the trail. The activities are also designed to generate a range of ideas, and there is often no single ‘correct answer’ to an activity. Each group booklet should be different.

The final brief activity is in the Discovery Zone. This exhibition contains many species of small, unusual animals which can be viewed from close up. There are a range of interesting hands-on learning activities available in the Discovery Zone if the students have enough time to explore.

Pre-visit ideas

- Get the students to consider some of the things that are classified, or sorted, into groups and sub-groups, and how this helps people.

For example,

- Videos & DVDs in a video shop
 - Belongings in their rooms
 - Things in the school's Resource Centre
 - Items at a supermarket
 - Tools, equipment etc in a shed
 - Cutlery, crockery and kitchen utensils at home.
- Ask students to devise a classification key which will sort a larged mixed group of one of the above sets of items. This could be like a branched tree.
 - Discuss the following terms with students, and explain the general “hierarchy” of the biological classification system.
Domain, Kingdom, Phylum, Class, Order, Family, Genus, Species, Subspecies

Post-visit ideas

- Discussion / Essay / Research tasks on Animal classification. Possible topics:
 - Some of Australia's Aboriginal people have very good knowledge of native animals, their habits and their uses as food, by-products, environmental indicators etc. Many animals are the subject of traditional stories. Discuss how aboriginals may have classified Australian animals. You could use a 'mud map' or tree diagram to simplify your ideas.
 - Human beings belong to the species *Homo sapiens*. Research one of the other species of the genus *Homo* : Find out when and where they lived on Earth, what they had in common with modern humans and how they differed. What do anthropologists think about their social structure and way of life?
 - Students choose a favourite animal and research its classification into domain - kingdom - phylum etc. down to species level. Find out what were the main features of the animal which were used to place it into each of these groups.

Links to SACSA Framework

This trail is designed to be inquiry based and student-focussed. Its use by small groups of students, working cooperatively, should strongly support learning processes.

Essential Learnings. Thinking, Interdependence, Identity and Communication.

Key Competencies. KC1: collecting, analysing and organising information,
KC2: communicating ideas and information,
KC3: planning and organising activities,
KC4: working with others in teams.

SACSA Learning Outcomes.

Science – Life systems

- 2.5 Explores relationships between living things by posing investigable questions about features and functions.
- 4.6 Explores how living things have changed over geological time and debates the value of species diversity and the ethics of human intervention.

Background notes for teachers, supervisors & students

This trail is designed to be completed by groups of 2-4 students, sharing ideas. Completing one booklet for each group may be better (and environmentally more sound) than each member of the group producing an identical copy.


Groups could have designated writers, navigators and trip planners, with everyone contributing ideas.

The Giant Pandas are part of the **Orders** and **Families** section of the trail. These observations should be done during the time your class is booked into the Panda viewing area.

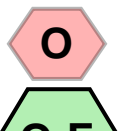
Sufficient time needs to be allowed for reasonable movement, observations and discussions to take place.

Hints for each section of the trail:

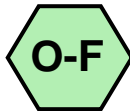
Phylum This is a theoretical section, involving the use of a dichotomous key to classify animals into 5 phyla.

Class Because animals sometimes hide or displays change, alternatives are available for the 9 animals to be used. **Only one animal from each row** in the table should be used. Check the map – the  symbols indicate the location of the animals to use.


Order Many animals are listed, but **only a few from each group** need to be observed in detail. However, **students should observe all the Carnivora animals listed in detail.**




Indicates animals for the Order section








indicates Carnivores for the Order and **Family** sections

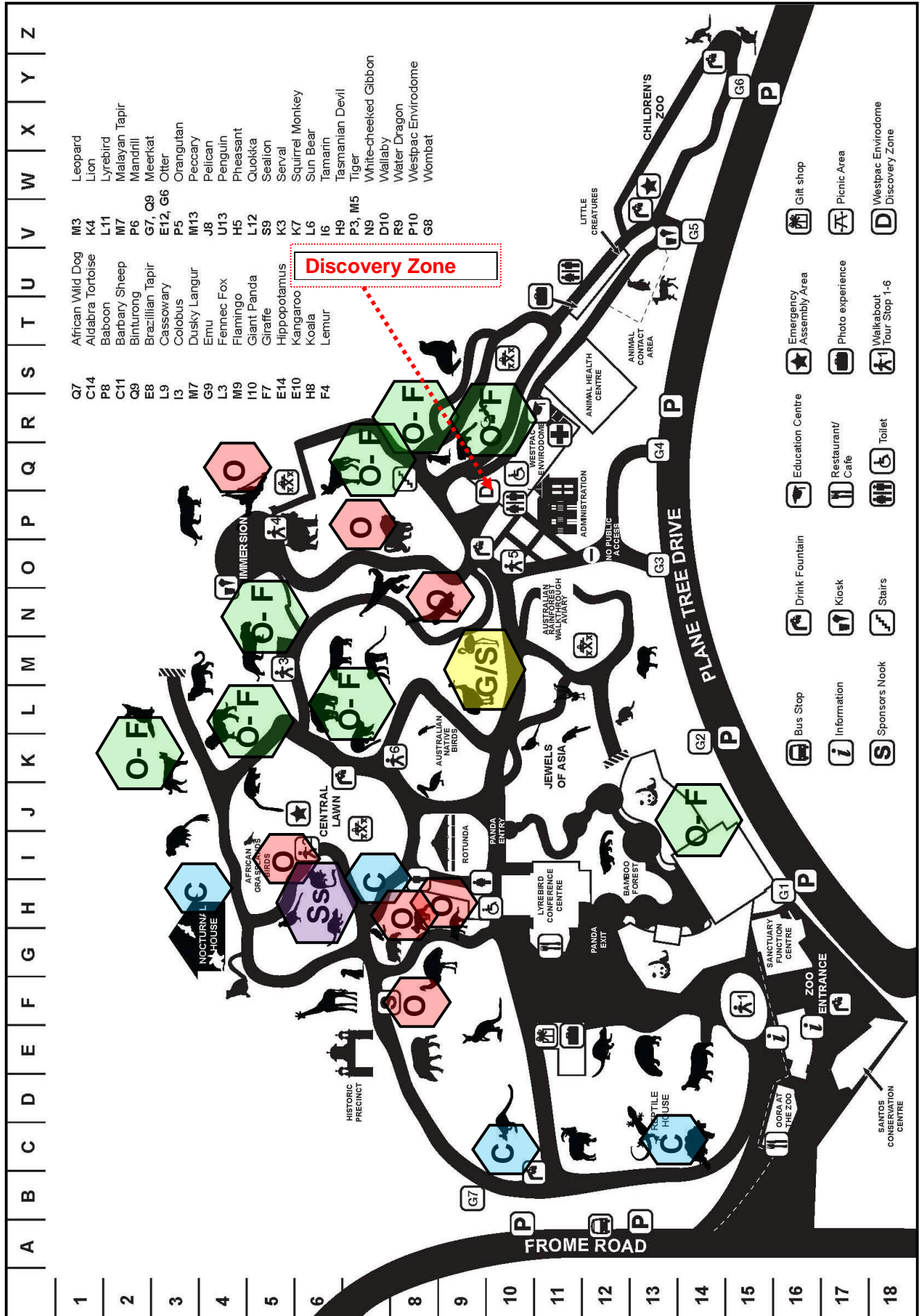
Genus / Species The Tamarin House is shown as  on the map.

Subspecies The Flamingo enclosure is marked as  on the map.

Discovery Zone This final section gives you the opportunity to use the classification knowledge you have acquired in an enjoyable and interesting part of the Zoo.

Key

-  Observe carefully
-  Discuss and share ideas with your group
-  Write down your thoughts
-  Challenge question
-  Did you know?



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
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- Q7 African Wild Dog
- C14 Aldabra Tortoise
- P8 Baboon
- C11 Barbary Sheep
- E8 Binturong
- L9 Brazilian Tapir
- I3 Cassowary
- M7 Colobus
- G9 Dusky Langur
- L3 Emu
- M9 Fennec Fox
- I10 Flamingo
- F7 Giant Panda
- E14 Giraffe
- E10 Hippopotamus
- H8 Kangaroo
- F4 Koala
- Lemur

Discovery Zone

- M3 Leopard
- K4 Lion
- L11 Lyrebird
- M7 Malayan Tapir
- P6 Mandrill
- G7, Q9 Meerkat
- E12, G6 Otter
- P5 Orangutan
- M13 Peccary
- J8 Pelican
- U13 Penguin
- H5 Pheasant
- L12 Quokka
- S9 Sealion
- K3 Serval
- K7 Squirrel Monkey
- L6 Sun Bear
- I6 Tamarin
- H9 Tasmanian Devil
- P3, M5 Tiger
- N9 White-cheeked Gibbon
- D10 Wallaby
- R9 Water Dragon
- P10 Westpac Envirodome
- G8 Wombat

- Bus Stop
- Drink Fountain
- Education Centre
- Emergency Assembly Area
- Gift shop
- Information
- Kiosk
- Restaurant/Cafe
- Photo experience
- Picnic Area
- Sponsors Nook
- Toilet
- Walkabout Tour Stop 1-6
- Westpac Envirodome Discovery Zone

CLASSIFICATION TRAIL –Secondary

Living things are classified into groups which have some structural features in common. These groups are each further divided into subgroups using more structural features of the organisms to sort them. This continues until each species is given a unique 2 (or 3) part name.

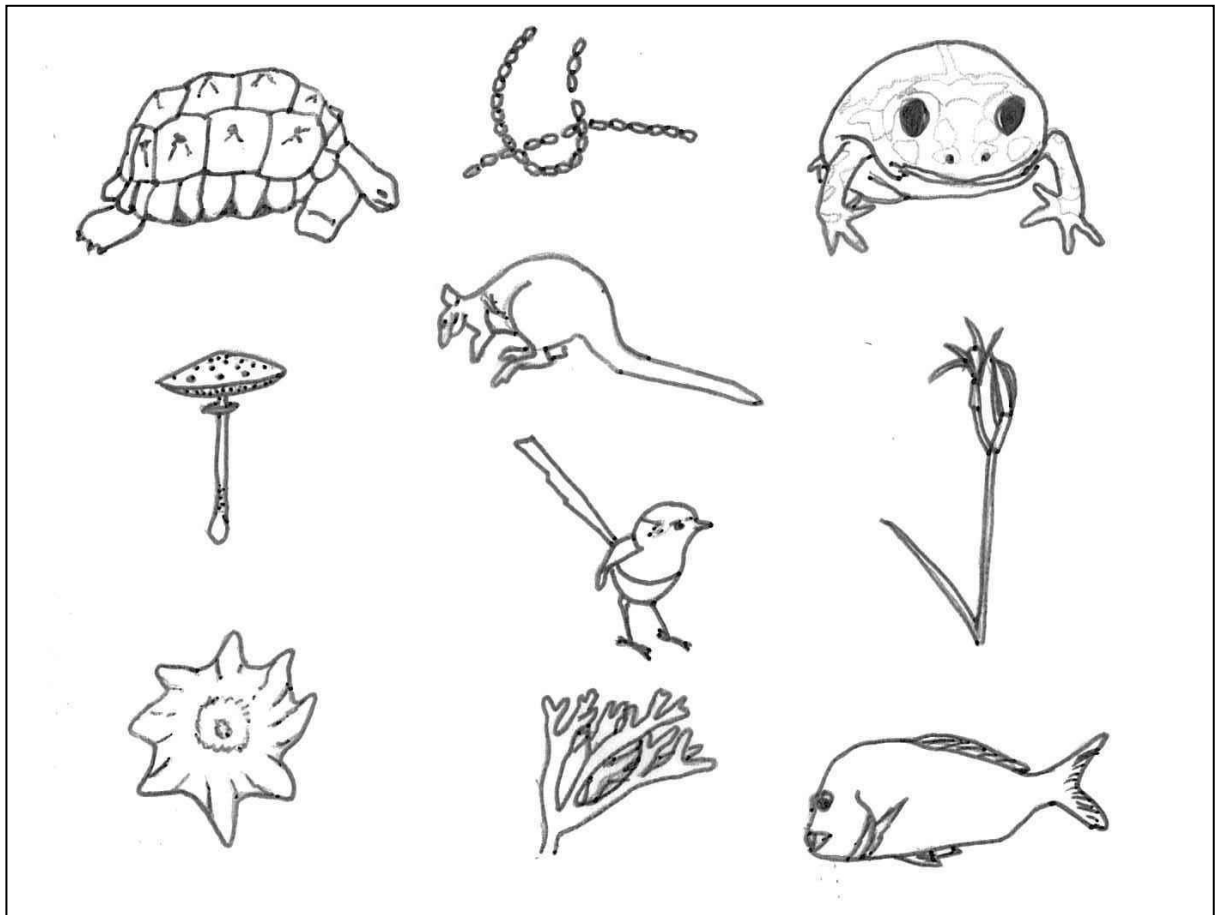
? **Did you know:** A **species** is a group of animals which look similar, and are able to interbreed freely in natural conditions, producing healthy offspring which are fertile when mature.

KINGDOMS

The first step in the classification of a living organism is to place it in a **domain**. The domains are then broken into **kingdoms**. Scientists use important differences in the cell structures of living things to classify them into domains and kingdoms.

The animal kingdom is part of the Eucaryota domain.

💡 From the array of organisms below, circle the ones that you think would be placed in the **Animal kingdom**.



Consider the living things that you have identified as part of the **Animal** kingdom.
What are some features that they all have, which none of the non-animal species possess?





PHYLUM (plural: phyla)

The Adelaide Zoo's main focus is the animal kingdom.

The animal kingdom is broken into many **phyla** according to major structural features. Structural features are things like wings, the number of legs, body symmetry, shell, body segments, eye location etc.

All **vertebrates** belong to a phylum called **Chordata** which means they have a nervous system consisting of a swollen section at one end (the brain,) and a long thin section along the back of the animal (the spinal cord.) The whole nervous system is surrounded by tough protective material – in most cases this is the skull and the backbone.






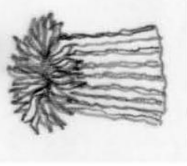
There are many phyla of **invertebrates**, which don't have a skull and backbone, but only a small number of these are kept at the Adelaide Zoo. You may see them in the Discovery Zone of the Envirodome.






Use the **dichotomous key** below and your general knowledge to classify the animals in the table into one of 6 phyla.

(Note: this key is a simple one, which is useful in classifying these 6 phyla only. A more complex one is needed to sort all animal phyla.)

Simplified animal phylum classification key

- 1a. Animal has bilateral symmetry. (2 sides look like mirror images). *Go to 2*
- 1b. Animal does not have bilateral symmetry. *Go to 3*
- 2a. Animal has a hard outer covering (exoskeleton) and jointed legs
.....*phylum **Arthropoda***
- 2b. Animal does not have a hard outer covering and jointed legs. *Go to 4*
- 3a. Animal has radial symmetry. (Can be rotated about a central axis to
a new position which is an image of the original.).....
.....*phylum **Cnidaria***
- 3b. Animal does not have radial symmetry.....
.....*phylum **Porifera***.
- 4a. Animal has an internal skeleton protecting its central nervous system
.....*phylum **Chordata***
- 4b. Animal does not have an internal skeleton protecting its C.N.S. . *Go to 5*
- 5a. Animals body consists of a series of very similar segments.....
..... *phylum **Annelida***
- 5b. Animal's body does not consist of a series of very similar segments.....
..... *phylum **Mollusca***


Animal	Diagram	Phylum
Jellyfish		
Camel		
Earwig		
Sea sponge		
Earthworm		
Sea Anemone		


Animal	Diagram	Phylum
Lizard		
Yabby		
Leech		
Squid		
Snail		


CLASSES

Most of the animals at Adelaide Zoo belong to the Chordata (or vertebrates) phylum.

In order to subdivide vertebrates into **classes**, a number of structural features are used.



 Observe **one** of the animals from each selection below, **circle it or write its name in**, and fill in the table as well as you can. (Circle or highlight best descriptions)

 If you cannot see the feature, someone in your group may know the answer for that animal.


Animal selection (circle the animal used or specify its name.)	Body covering Fur / Feathers / Dry scales / Wet scales / Wet skin	Feed young milk? Yes / No	Breathing Organs Lungs Gills Skin	Body temperature Constantly warm or Varies
 Alligator OR Crocodile (<i>Reptile House</i>)	Fur / Feathers / Dry scales / Wet scales / Wet skin	Yes / No	Lungs Gills Skin	Constantly warm or Varies
Splendid Tree Frog OR Dying Poison Dart Frog (<i>Reptile House</i>)	Fur / Feathers / Dry scales / Wet scales / Wet skin	Yes / No	Lungs Gills Skin	Constantly warm or Varies
Yellow-footed Rock-wallaby OR Red Kangaroo	Fur / Feathers / Dry scales / Wet scales / Wet skin	Yes / No	Lungs Gills Skin	Constantly warm or Varies
Kookaburra OR Owl – name it	Fur / Feathers / Dry scales / Wet scales / Wet skin	Yes / No	Lungs Gills Skin	Constantly warm or Varies
Murray Cod OR Queensland Lung Fish (<i>Nocturnal House</i>)	Fur / Feathers / Dry scales / Wet scales / Wet skin	Yes / No	Lungs Gills Skin	Constantly warm or Varies


Scientists use **body coverings** as one of the structural features which helps to divide the vertebrates phylum into classes.

For each of the 5 vertebrates groups divided like this, name the class and give **one other feature**, which all members of the class possess. (This feature need not be unique to the class.)

 Body covering	Class name	Other features of this class
 Fur		
Feathers		
Wet scales		
Dry scales		
Wet skin		

Can you think of any vertebrate animals, which are difficult to put into classes using body coverings as the method of classifying them? If so, give an example and explain what the difficulty is.


 _____

 _____

? Did you know? In fact, within the fish group there is such a big range of structures that most classification systems now divide the fish of the world into 3 – 5 different classes!

 **Challenge question:**

 *Can you think of 3 jobs or occupations where the classification of animals is useful?*

 _____

ORDERS

Each of the classes are divided into **orders**.

The number of orders within a class varies:

Mammals	21 orders
Reptiles	4 orders
Amphibians	3 orders
Birds	25 – 30 orders
Fish	55 - 60 orders

Below are some **orders** of **mammals** and some of the Zoo species which belong in these orders

Carnivores

African Wild Dog
Sumatran Tiger
Dwarf Mongoose
Malayan Sun Bear
African Lion
Meerkat
Giant Panda
Fennec Fox

Marsupials

Tammar Wallaby
Tasmanian Devil
Koala
Wombat
Bilby

Primates

Siamang
Hamadrayas Baboon
Golden-lion Tamarin
Sumatran Orangutan

 Carefully observe **all** members of the **Carnivores** order and **some** of the members of the other 2 orders.

What are the **structural** features which members of each order have in common, and which distinguish them from the other orders? Eg. Eye placement, teeth type, feet structure, movement etc.



Carnivora

Marsupialia



Primates

For each of the orders above, do the species at the Zoo have **anything else** in common **apart from structures**? Eg. Location in the world, habitat, lifestyle, position in food chains?

 **Carnivora**

 **Marsupialia**

Primates




FAMILIES

Each order is divided into **families** of organisms which have more things in common with each other.

Consider again the members of the order Carnivora that live in the Zoo:

- ie. African Wild Dog
- Sumatran Tiger
- Dwarf Mongoose
- Malayan Sun Bear
- African Lion
- Meerkat
- Giant Panda
- Fennec Fox



 Try to group these 8 species into a number of **families**, each having more features in common. Use as many or few of the groupings below as you need.

For each suggested family, give one feature which helped you to decide to group these animals together.

	Names of animals	Features shared by these animals
Family 1		
Family 2		
Family 3		
Family 4		
Family 5		



GENUS & SPECIES

? A **genus** is a group of **species** that are very similar in structure and behaviour. However the various species within a genus do not normally breed freely with each other.
Eg. Dogs belong to the species *Canis familiaris*: they are in the genus *Canis*. Their close relative the Grey Wolf belongs to the species *Canis lupus*.

Sometimes more information is learned about animal populations, which were assumed to be a single species, showing that they do not normally interbreed in nature. So they were not really a single species at all.

Where it has been decided to further subdivide a species, a third word is used – this is the **subspecies** name.

👁️ Flamingoes belong to the genus *Phoenicopterus* (pronounced Feen-is-ip-te-rus).
Observe and write down the scientific names of the 2 flamingos at Adelaide Zoo.

✍️ Flamingo 1 _____

Flamingo 2 _____

What are some features which the two flamingo species have in common, which are different to other bird species?

✍️ _____

Can you see any obvious differences between Greater Flamingo and the Chilean Flamingo?

✍️ _____

💡 Which of these two species do you think would be most like the Caribbean Flamingo, *Phoenicopterus ruber ruber*?
Explain why you think so?

✍️ _____

? Did you know that the 2 flamingoes at Adelaide Zoo are the oldest animals here? They arrived at Adelaide Zoo more than 75 years ago, and their ages were not known when they arrived.



SPECIES AND SUBSPECIES

?

In the Tamarin House you will see Golden Lion Tamarins and Black Lion Tamarins. There are 2 other species of lion tamarins in South America: the Golden-headed Lion Tamarin, and the fourth, the Black-faced Lion Tamarin, which was only discovered in 1990!

Both of Adelaide Zoo's species come from southern Brazil. Both have lost over 95% of their original coastal forest maintenance habitat.

As species, they are coming back from the brink of extinction due to international breeding programs and conservation efforts in Brazil; in 2003 these 2 species were considered Critically Endangered by the IUCN, the organization which decides the threatened status of species. See <http://www.iucnredlist.org/>

However in 2008 they were both reclassified to Endangered, which is not quite as severely threatened.

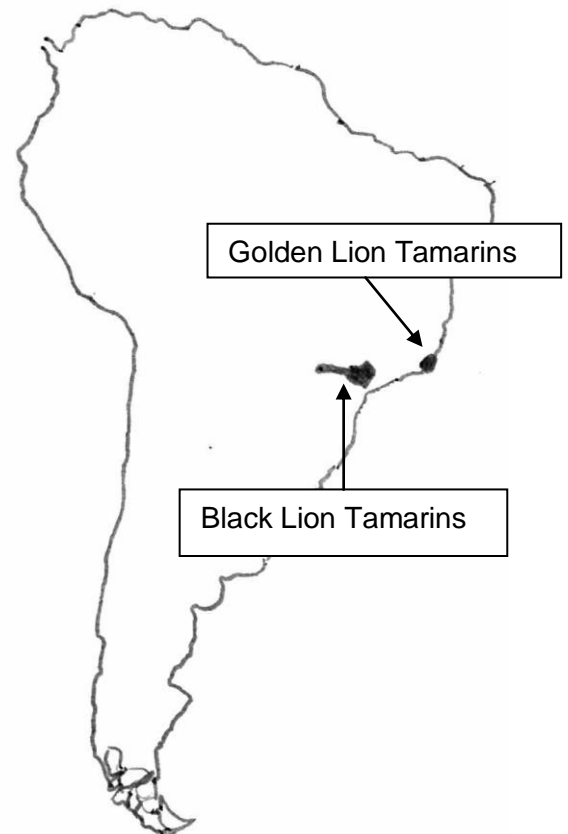
👁️

Observe the map of South America, which shows the current locations of wild populations of these 2 species. Their habitat has not overlapped in recorded history.

However, biologists conclude that in the past there was a species that was ancestor to them both.

What evidence do you think they may use to reach this conclusion?

✍️



All the lion tamarins were once thought to belong to the same species. However the classification of this group is constantly changing as a result of new research and the discovery of further species.

Write down the scientific names of these 2 Tamarins **as they appear on the signage**:

Golden Lion Tamarins _____

Black Lion Tamarins _____

✍️

The current scientific names for these species according to the IUCN are *Leontopithecus rosalia* (GLT) and *Leontopithecus chrysopygus* (BLT). They are different from the Zoo's signage because, since the signage was written, their names have been officially changed to indicate different species!



The confusion and “grey” areas found in classifying living things can be best understood in the light of evolutionary theory.

Over time, the genetic make up of populations (the gene pool) changes, often with an increase in frequency of genes which assist survival of the species in a changing environment.

If populations of a species become separated then over many generations their gene pools change in different ways; they may become different enough to make natural breeding unlikely, even if the populations are reunited – new species have developed.

This is summed up in a quote by noted geneticist and evolutionary biologist Theodore Dobzhansky “Nothing in biology makes sense except in the light of evolution”.



Challenge question

Consider a population of small burrowing mammals which are very well adapted to their grassland habitat on a very large island.

Imagine that the over many years, earth movements cause a river course to change and this separates the population into 2 separate groups, which cannot cross the river.

Later, burrowing snakes arrive on one part of the island on drifting logs after a big storm on the nearest mainland.

Over centuries, these snakes multiply and they become the main predator of the burrowing mammals on that part of the island. The snakes don't cross the river.

Discuss how the features and behaviours of the burrowing mammals on the snake side of the island may change over the centuries.



Thousands of years later, if the river course changed again and the two mammal populations are able to again mix together, what are some possible scenarios for the interaction of the individuals with each other?



DISCOVERY ZONE

The Discovery Zone contains a number of unusual animal species. There is not much information about the classification of the animals on the signage.

In discussion with your group, choose 5 animal species in this area, and for each, identify its phylum and class. Give a reason for your answers

Name	Phylum	Class	Reason for this classification

