

# The Human Story



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# The Human Story



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This resource is to be used as part of an excursion to Taronga – home to over 2,627 animals representing 315 species/sub-species and including nine species of primates. The resource and related workshop is linked to the NSW School Curriculum and has been developed in consultation with Department of Education and Training Curriculum Coordinators and NSW School Teachers. It is a comprehensive kit of information and activities designed to ensure maximum benefit to you during your excursion to Taronga Zoo.

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## Introduction

The Primate order contains a wide variety of animals including lemurs, bush babies and lorises, tarsiers, marmosets and tamarins, gibbons, orang-utans, Old and New World monkeys, chimpanzees, gorillas and humans.

Primates occupy a wide range of habitats and show a range of adaptations for their specific environments. Some species are terrestrial, others arboreal; some are nocturnal, others diurnal.

They range in size from less than 100 grams to over 100 kilograms. Gestation length ranges from around two months to about nine months. A large number of primate species are found in tropical latitudes where there is a continuous supply of fruits, nuts, shoots, buds and insects to eat and environments like forest and savannah provide suitable habitat. The interaction between primates and the forest is complex.

Primates have existed for 70 million years. The first primates were probably small insectivorous forest-dwelling mammals, similar in appearance to tree shrews. During their evolution, some species of primates have become extinct, however more recently Homonid Primates (including the human species) have evolved.

Humans, although only one living species of primate, are responsible for the declining numbers of many other primate species through destruction of habitat, hunting and exploitation.



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## NSW School Curriculum Links

### The Human Story – Curriculum Outcomes from a Zoo Excursion

Taronga Zoo exhibits nine primate species enabling students to develop an excellent introductory understanding of the diversity of this mammal group.

The following table outlines the outcomes and relevant activities within this resource.

Students learn to:

Students learn this through:

Outline the general classification hierarchy from phylum to species	Pre-excursion activity, Primate workshop
Define the term species and outline criteria used to identify a species	Pre-excursion activity, Primate workshop
Outline features that classify humans as: <ul style="list-style-type: none"> <li>- mammal</li> <li>- primate</li> </ul>	Primate workshop Excursion Activities: <ul style="list-style-type: none"> <li>• Table 1</li> <li>• Observation Activity 1 and 2</li> </ul>
Describe primate characteristics, including: <ul style="list-style-type: none"> <li>- hand/foot structure and function, including opposable thumb or toe</li> <li>- skull shape and function</li> <li>- brain size relative to body size</li> <li>- arrangement of the vertebral column to the degree of upright stance</li> <li>- vision, including degree of stereoscopic vision, colour vision</li> </ul>	Primate workshop Excursion Activities: <ul style="list-style-type: none"> <li>• Observation Activity 1 and 2</li> <li>• Table 4 Skull Features</li> <li>• Table 5 Teeth features</li> <li>• Table 6 Foot features</li> <li>• Table 7 Hand features</li> </ul>
Describe primate characteristics, including: <ul style="list-style-type: none"> <li>- reproductive features, including single live young and relatively long gestation</li> <li>- parenting and group bonding</li> </ul>	Primate workshop Excursion Activities: <ul style="list-style-type: none"> <li>• Table 8 Primate Behaviour Obs</li> <li>• Table 9 Advanced Behaviour Obs</li> </ul>
Describe primate characteristics in: <ul style="list-style-type: none"> <li>- prosimians</li> <li>- new and old world monkeys</li> <li>- apes</li> <li>- humans</li> </ul>	Primate workshop Post-visit Activities: <ul style="list-style-type: none"> <li>• Table 10 Compiling Obs</li> <li>• Table 11 Comparing Prosimians</li> </ul>

A student:

Students learn this through:

H16 Justifies positive values and attitudes towards.....consequences of the applications of science	Post-excursion Activity
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## Background Information

### What Makes a Primate a Primate?

Primates have many features but very few that every member shares. It can therefore be said that there are general features, however many exceptions occur as features have been lost or modified during the evolutionary process.

#### **Hands and feet**

Primates have five flexible digits, including a toe and thumb which is usually opposable (can be moved across to touch other fingers and toes). These opposable digits allow the animal to grasp and manipulate objects. Primates also have two types of grips, the power grip and precision grip. The power grip uses the fingers and palm of the hand; the precision grip uses the tips of the fingers and thumb.

#### **Fingernails and toenails**

Most primate fingertips have nails which protect the sensitive pads on the ends of the fingers. Specialised feeders such as marmosets and tamarins have retained claws.

#### **Forward-facing eyes**

In general, primates have eyes which are located on the front of the face. This provides a good area of overlap allowing stereoscopic vision, an important feature for an animal jumping from tree to tree.

#### **Reduced sense of smell**

As primates have advanced, they have evolved a flatter face and a poorer sense of smell.

#### **Brain size relative to body size**

Primates have well developed brains when compared to other mammals of approximately equal size.

#### **Well organised social structures**

Primates have a long gestation period, generally producing only a single offspring. Young usually stay dependent for a long period of time, in which they learn the necessary skills associated with group living.

### Evolutionary Trends Within the Primates

The following also identify features which are well developed in humans:

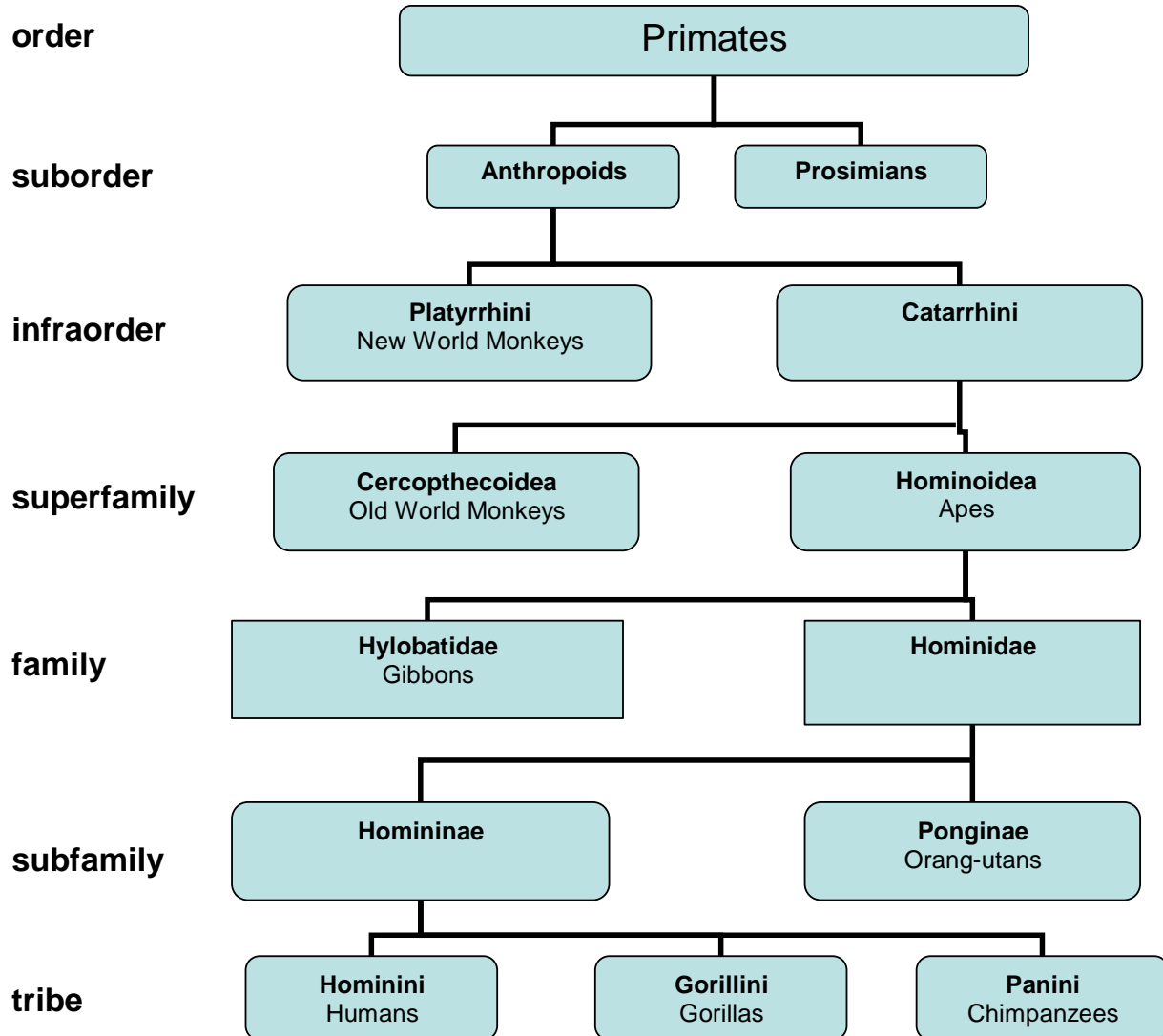
- flat nails on fingers and toes
- sensitive pads on the underside of fingers and toes for gripping and feeling
- increasing mobility of individual digits, especially the thumb and big toes, leading to opposability
- gradual shortening of the muzzle and flattening of the face
- decline in the sensitivity of smell - particularly in the Anthropoids
- increasing reliance on vision leading to efficient stereoscopic colour vision
- progressive increase in the relative and absolute size of the brain
- reduction in the rate of reproduction
- increased efficiency of placenta
- protracted maternal care
- delayed sexual maturity
- extended life spans
- progressive dependence on a diet of fruit and/or foliage
- increasing complexity of social communication and behaviour (for most) progressively upright stance.



## Humans and the Primate Classification Tree

Classification systems are designed for convenience and as such are arbitrary by nature. This is certainly the case when studying the classification of primates and in particular the arrangement and placement of the great apes.

The classification tree below is a recently revised version that takes into account new information acquired through research using improved, up-to-date scientific techniques. This evidence has shown the African apes including chimpanzees, bonobos and gorillas are genetically similar to humans and should be grouped with them as Hominids.



### Classification of Primates

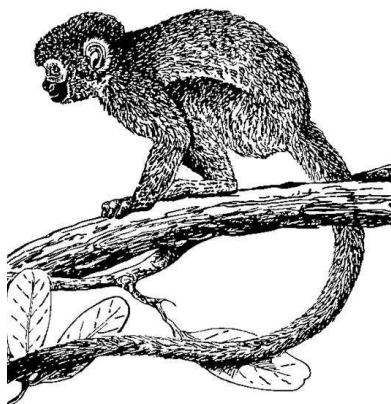
#### Prosimians and Anthropoids

Whilst the characteristics that all primates share are those that we use to classify primates into one group, below are those characteristics we use to divide all primates into two main groups



#### **Prosimians** (*before monkeys*)

- long noses with naked, moist snout (rhinarium) for accurate smelling
- muzzle and brows with prominent whiskers
- eyes face slightly sideways and are adapted for nocturnal vision
- ears large and mobile
- toilet claw on second digit of foot, flat nails elsewhere
- specialised scent glands, especially in genital region
- 36 teeth (34 teeth in tarsier)
- upright, horizontally projecting lower incisors



#### **Anthropoids** (*man-like*)

- short snouts (several exceptions eg mandrills)
- dry noses, hairy skin between nostrils and upper lip
- lack prominent tactile whiskers
- ears small and immobile
- eyes face forward for binocular vision, colour
- flat nails on all digits (exceptions including tamarins/marmosets)
- 32 to 36 teeth

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## Primate Behaviour

Most primates are social animals and form groups which are stable in their membership.

The advantages of living in groups include:

- increasing the chance of a predator being detected
- better able to access food and defend territory
- increasing the chance of successful reproduction
- greater opportunity for learning and skills sharing

## Primate Group Structure

Primate groups differ considerably in structure and include:

- **Solitary individuals;** may only meet others during breeding e.g. orang-utans.
- **Family groups;** often consist of a breeding pair and their offspring. On reaching maturity the young leave the group to seek mates e.g. marmosets, gibbons.
- **Harem groups;** consisting of a single breeding male and a number of mature females eg. many Old World monkeys, gorilla. In some of these groups the young and subordinate males are allowed to remain but seldom get the opportunity to mate. Harem units may congregate in larger bands or herds.
- **Bachelor colonies;** form when males mature and are excluded from family groups. These are also known as a male troupe.
- **Multi-male groups;** consisting of several breeding males and a larger number of females e.g. Howler Monkeys, Red Colobus Monkeys, Savannah
- baboons.

Groups may vary in size from day to day but belong to larger stable communities which may follow seasonal cycles e.g. chimpanzees.

## The Dominance Hierarchy

In most primate groups a well defined dominance hierarchy exists.

Rank in the hierarchy determines access to food, sleeping sites and mates, and influences breeding success of the individual.

The complex network of social relationships within the group requires an elaborate and accurate system of communication. Primates have evolved a variety of visual and vocal signalling systems.

## Pre-visit Activities

Discuss with students the aim of the excursion. Students should understand that they are going to study primate structure, classification, behaviour and communication.

Discuss with students which primate features are likely to be observable at the Zoo, and which will require research e.g. teeth, toes, clavicle, position of eyes and behaviour.

### **Structural Characteristics**

Discuss the meaning of terms to be used (see Glossary) e.g. callosities, wet/dry rhinarium, opposability, prehensile tail and nasal septum.

Discuss the primate features of humans. (See Background Notes) You could use the human skeleton, skull etc.

### **Behaviour/Communication**

Discuss how behaviour in captivity may be different from behaviour in the wild. Changed environmental elements that be discussed include: lack of predators, food provided rather than gathered, how numbers in exhibits are managed in a much smaller area than normal.

Students should be familiar with terminology to be used:

- hierarchy (dominant male, adult female, sub-adults, juveniles, infants)
- dominance/submission
- territory/personal space
- innate/learned behaviour.

Students could design their own sheets for recording the type and frequency of different behaviours. Discuss what these behaviours might be.

Advise students that behaviour studies require patience.

Remember primates use body language to develop a social hierarchy. Many use eye contact to intimidate. Humans can therefore unknowingly increase tensions in a primate troupe if during the course of an observation exercise students stare for long periods of time at primates. One technique is to look out of the corner of an eye to observe them.

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## At the Zoo

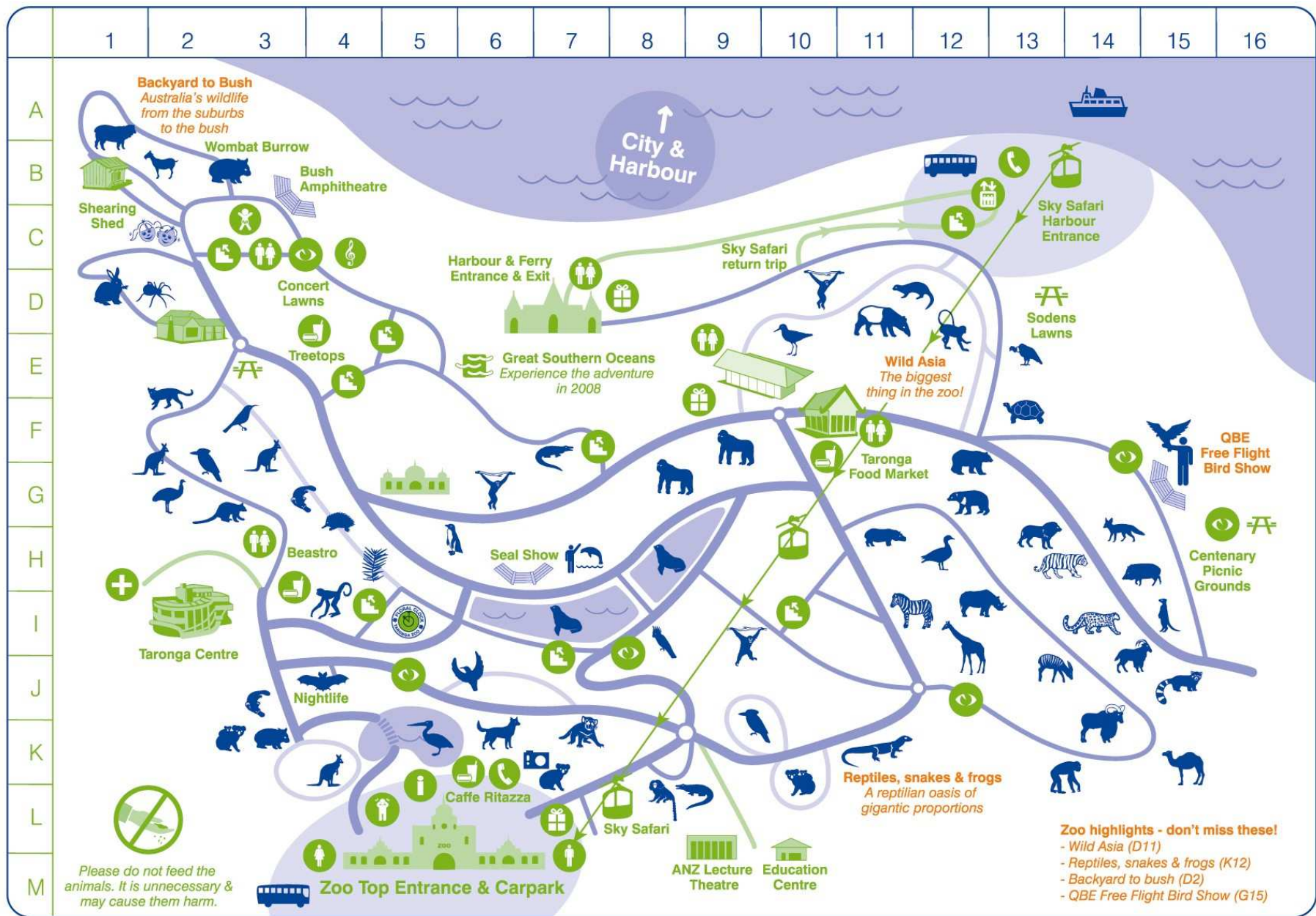
### Student Activities

Table 1 Comparison of Primates with Other Mammals	Page 14
Table 2 Structural Features Observation	Page 15
Table 3 Primate Range, Behaviour and Movement Comparison	Page 16
Table 4 Compare and describe physical characteristics of the <i>SKULL</i> .	Page 17
Table 5 Compare and describe physical characteristics of the <i>TEETH</i> .	Page 17
Table 6 Compare and identify physical characteristics of the <i>FOOT</i> .	Page 18
Table 7 Compare and identify physical characteristics of the <i>HAND</i> .	Page 18
Table 8 Comparison of Primate Communication Behaviours	Page 19
Table 9 Advanced Behaviour Observation Exercise - Individual primate behaviour.	Page 20

Use the table below and the map that follows to find the relevant animals and exhibits.

The table below also indicates which activity table needs to be completed at each particular primate exhibit.

Animal	Activity	Map Reference
1. Koala	Table 1	K 10
2. Chimpanzee	Table 1, 2, 3, 5, 6, 7, 8	K 13
3. Giraffe	Table 1	I 12
4. Orang-utan	Table 2, 3, 8	I 9
5. Snow Leopard	Table 1	I 13
6. Himalayan Tahr	Table 1	J 14
7. Francois Langur (Leaf-eating Monkey)	Table 2, 3	Wild Asia E 12
Gibbons: 8. Silvery Gibbon	Table 2, 3	Wild Asia D 10
9 Mueller's Gibbon		G 6
10. Gorilla (also include skull, foot, hand and teeth models)	Table 2, 3, 4, 5, 6, 7, 8	G 8
11. Spider Monkey	Table 1, 2, 3	I 4
12. Tamarin	Table 2, 3	L 8
13. Squirrel Monkey		L 8



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**Table 1 Comparison of Primates with Other Mammals**

	Hooves? Nails? Claws?	Number of toes	Opposable thumb? Big toe?	Prominent or reduced snout?	Herbivore Carnivore Omnivore	<b>ORDER</b>
Human						<b>PRIMATES</b>
Chimpanzee						<b>PRIMATES</b>
Spider Monkey						<b>PRIMATES</b>
Snow Leopard						<b>CARNIVORA</b>
Koala						DIPROTODONTIA
Giraffe						<b>ARTIODACTYLA</b>
Himalayan Tahr						<b>ARTIODACTYLA</b>

What characteristics distinguish the primates from other placental (eutherian) mammals?

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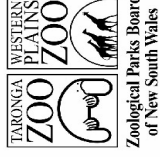
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**Table 2 Structural Features Observation**

Use ✓ or X

	Body Structure		Arm/leg Ratio			Thumbs		Hands		Tail			Shape of face		Nasal Septum		Callosities		Rhinarium	
	Human-like	Dog-like	Arms/legs equal	Arms<legs	Arms>legs	Present	Small, absent	Nails	Claws	Absent	Present: prehensile	Present: non prehensile	Snout prominent	Snout reduced	Thin	Wide	Present	Absent	Dry	Wet
Human																				
Gorilla																				
Chimpanzee																				
Cotton-top Tamarin																				
Gibbon (Silvery or Mueller's)																				
Francois Langur (Leaf-eating Monkey)																				
Spider Monkey																				
Orang-utan																				
Squirrel Monkey																				

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**Table 3 Primate Range, Behaviour and Movement Comparison**

Use animal observation and available visitor information to complete the table below.

Geographic Range <small>Where it is found</small>	Time spent Terrestrial and Arboreal	Usual Movement <small>Bipedal Quadrupedal Brachiation Leaper</small>	Use of tools	Size of social group	Types of social interactions observed	Describe evidence of social structure
Human						
Gorilla						
Chimpanzee						
Cotton-top Tamarin						
Gibbon (Silvery or Mueller's)						
Francois Langur (Leaf-eating Monkey)						
Spider Monkey						
Orang-utan						
Squirrel Monkey						

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Use the models of skulls, feet, hands and teeth located at the Gorilla Exhibit to complete the following tables.


**Table 4 Compare and describe physical characteristics of the SKULL.**

Discussion Points: brain size (cranial capacity) to body size, importance of sense of smell.

	Skull <i>rounded or ridged (crested) on top</i>	Heavy ridge over eyes: <i>present or absent</i>	Ratio of brain cavity to head size: <i>small or large</i>	Prominent teeth and jaw <i>yes or no</i>	Nose <i>Prominent or flattened</i>
<b>Human</b>					
<b>Chimpanzee</b>					
<b>Gorilla</b>					

**Table 5 Compare and describe physical characteristics of the TEETH.**

Discussion Points: Diet of great apes, teeth: protection or threat, evolutionary refinement of dentition.

	Total number of teeth	Teeth configuration: <i>parallel or parabola</i> 	Dental formula *	Distance (in cm) from front to back teeth	Approximate length (in cm) of canine
<b>Human</b>					
<b>Chimpanzee</b>					
<b>Gorilla</b>					

\* **Dental Formula** record the number of teeth: top & bottom incisors to molars (one side only)

	<b>top teeth</b>			
	incisors	canines	premolars	molars
	$\frac{2}{2}$	$\frac{1}{1}$	$\frac{2}{2}$	$\frac{3}{3}$
ition F		<b>bottom teeth</b>		

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Use the models of skulls, feet, hands and teeth located at the Gorilla Exhibit to complete the following tables.

**Table 6 Compare and identify physical characteristics of the FOOT.**

Discussion Points: movement, terrestrial or arboreal.

	Size of big toe relative to other toes <i>smaller, same or larger</i>	Gap present between big toe and other toes <i>yes or no</i>	Foot shape <i>wide or narrow</i>
Human			
Chimpanzee			
Gorilla			



From your observations decide if the foot is used for:  
(tick your answer)

Grip	<input type="checkbox"/>
Walking upright	<input type="checkbox"/>
Grip	<input type="checkbox"/>
Walking upright	<input type="checkbox"/>
Grip	<input type="checkbox"/>
Walking upright	<input type="checkbox"/>

**Table 7 Compare and identify physical characteristics of the HAND.**

Discussion Points: Manipulation of objects, fine versus gross motor skills, tool use.

	Palm <i>wide or narrow</i>	Thumb size compared to other fingers <i>large or small</i>	Jointed fingers indicating movement	Finger prints for grip and individual identification	Palm lines indicating flexible movement	Size of gap between fingers and thumb <i>large or small</i>
Human						
Chimpanzee						
Gorilla						

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**Table 8 Comparison of Ape Communication Behaviours**

Observe the groups of primates and record communications behaviours you see and hear using the key below.

	Body Language or posture	Vocalisation	Touch (Tactile interaction)	Smelling others or ground (Olfactory)	Facial Expression
Orang-utan Solitary					
Chimpanzee Group					
Gorilla Group					
Human Group					
Use the Keys	St Stand Cr Crouch TA Turns Away CB Chest Beat L Lying Down PR Presents	Sc Scream G Grunt H Hoot L Language	G Groom T Touch P Play Ch Chase M Mount	Smelling: G Ground O Others	Gr Grimace BT Baring Teeth O Open Mouth P Pouting Lips

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**Table 9 Advanced Behaviour Observation Exercise - Individual primate behaviour.**

Choose **one** individual of any of the primate species you have observed in the previous activity.  
 Record their behaviour at 15 second intervals for **five minutes**, ie a total of 20 observations.  
 Use the keys or codes for your observations.  
*Working in pairs will be easier. One keeping time and one recording behaviours*

**Primate Common Name:** .....

Behaviour	Tally	Total
Stand		
Crouch		
Turn Away		
Chest Beat		
Lying Down		
Presents		
Scream		
Grunt		
Hoot		
Groom		
Touch		
Playing		
Chasing		
Mounting		
Smelling Ground		
Smelling Others		
Grimace		
Bare Teeth		
Open Mouth		
Pouting Lips		

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## Post- visit Activities

**Table 10 Classifying Taronga’s Primates**

Using the information gathered from your Zoo excursion, complete the table below.

Primate Group	Zoo Examples	Reasons for classification
Old World Monkey		
New World Monkey		
Ape		

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**Table 11 Comparing Prosimians**

Use the information collected from your visit to Taronga Zoo to complete the table below

Primate	Human	Gorilla	Silvery Gibbon	Francois Langur (Leaf-eating Monkey)	Spider Monkey	Tarsier	Aye Aye
<b>Primate Group</b>						Prosimian	Prosimian
<b>Body Structure</b> Human-like Dog-like							
<b>Arm/leg ratio</b> Arms/legs equal Arms<legs Arms>legs							
<b>Thumbs</b> Present Small, absent							
<b>Tail</b> Absent Present: prehensile Present: non-prehensile							
<b>Usual Movement</b> Bipedal Quadrupedal Brachiation Leaper							
<b>Terrestrial/ Arboreal</b>							
<b>Geographic Range</b> Where it is found							
<b>Hands</b> Nails Claws							
<b>Rhinarium</b> dry wet							
<b>Shape of face</b> Snout prominent Snout reduced							
<b>Nocturnal/ Diurnal</b>							

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## Keying Activity Primates at Taronga

Use the information collected from your visit to Taronga Zoo to design a dichotomous key that includes all the primate species held at the Zoo.

An example of a dichotomous key for birds from Taronga Zoo's Helmore Parrot Aviary is given below.

**Remember, in a dichotomous key there can only be two alternatives at each numbered step.**

- 1 a Body mainly black in colour.....*Go to 2*
  - b Body not black in colour..... *Go to 3*
  
- 2 a Yellow present in the tail feathers..... ***Yellow-tailed Black Cockatoo***
  - b Red present in the tail feathers..... ***Red-tailed Black Cockatoo***
  
- 3 a Body mainly white in colour..... *Go to 4*
  - b Body has colours other than white present.... *Go to 5*
  
- 4 a Yellow crest on top of the head; black bill..... ***Sulphur-crested Cockatoo***
  - b Blue eye patch; white bill..... ***Little Corella***
  
- 5 a Head, neck and belly pink in colour..... *Go to 6*
  - b Head, neck or belly red or crimson in colour.. *Go to 7*
  
- 6 a Crest present on top of the head..... ***Major Mitchell Cockatoo***
  - b White head; grey wings..... ***Galah***
  
- 7 a Mainly crimson in colour and/or blue cheeks. ***Crimson Rosella***
  - b Head, neck or belly red; black tail..... ***Australian King Parrot***

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### Graphing Activity Individual Primate Behaviour

Use the information collected in **Table 9** from your Zoo excursion to create a graph or chart showing the percentage of time spent doing each of the behaviours.



### Further Questions

1. Are the results of your behaviour study a true indication of the individual animals general behaviour? Explain your answer.

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2. How could a behaviour study of this nature be improved?

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3. Why is it important for Taronga Zoo to undertake individual behaviour studies of animals in the Zoo?

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### Topic of Discussion

#### The Role of the Modern Zoo

*“The role of zoos has dramatically changed in the past few decades. Modern zoos, like Taronga and Western Plains Zoos, no longer simply just display animals”*

### Instructions

#### Part 1 – Role of the modern public zoo

In small groups, discuss what you believe is the role of the modern public zoo, making specific reference to primate collections?  
(Use evidence from both your Taronga Zoo excursion experience and secondary research to support your answer).

One person should record your group’s discussion on a piece of butcher’s paper to be presented to the rest of the class.

#### Part 2 – Should public zoos exist?

In small groups, debate the positives and negatives of modern public Zoos.  
(Use evidence from both your Taronga Zoo excursion experience and secondary research to support your answer).

One person should record your group’s discussion on a piece of butcher’s paper to be presented to the rest of the class.



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## Useful Resources

### Books

BOURNE, G.H & PRINCE RANIER OF MONACO, 1977,  
*Primate Conservation*.  
Academic Press

KAVANAGH, Michael, 1983  
*A Complete Guide to Monkeys, Apes and Other Primates*.  
Jonathan Cape

JONES, S., MARTIN, R., PILBEAM, D., 1994  
*The Cambridge Encyclopedia of Human Evolution*  
Cambridge University Press

MACDONALD, Dr. David (Ed.), 1984  
*The Encyclopedia of Mammals. Vol. 1*.  
Allen and Unwin,

NAPIER, J. R. and P.H., 1985  
*The Natural History of the Primates*.  
British Museum

WOLFHEIM, J.H., 1983  
*Primates of the World*.  
University of Washington Press

### Websites

**The 2000 IUCN Red List of Threatened Species** [www.redlist.org](http://www.redlist.org)

**American Society of Primatologists**  
[www.asp.org](http://www.asp.org)

**Conservation International**  
[www.conservation.org](http://www.conservation.org)

**International Wildlife Education and Conservation (IWEC)** [www.iwec.org](http://www.iwec.org)

**Primate Classification**  
<http://www.life.umd.edu/classroom/bsci338m/Lectures/Primates.html>

**Primate Classification**  
[http://anthro.palomar.edu/primate/prim\\_6.htm](http://anthro.palomar.edu/primate/prim_6.htm)

**Primate Classification and Origins**  
<http://www.origins.tv/darwin/zoo/prosim.htm>

**Primate Info Net**  
[www.primates.wisc.edu](http://www.primates.wisc.edu)

**Primate Images**  
<http://www.primates.com/monkeys/index.html>

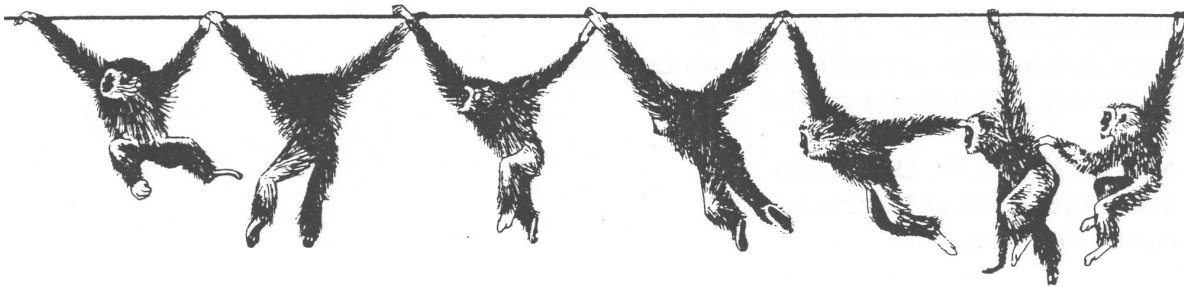
**Zoological Parks Board of NSW**  
Taronga and Western Plains Zoos website  
[www.zoo.nsw.gov.au](http://www.zoo.nsw.gov.au)

**Zoo's of the World**  
[www.zoos.org](http://www.zoos.org)

**Australian Museum Online**  
<http://www.amonline.net.au/human%5Fevolution/>

## Glossary

**Brachiation** Hand-over-hand movement used by some primates in trees. A non-brachiating primate moves through trees using its four limbs by walking, running, and leaping along branches.



**Callosities** Bare, hard pads of skin found either side of the anal region. They approximate our buttocks however, they lack a blood or nerve supply.

**Eutherian** The placental sub-class of mammals

**Nasal septum** A piece of tissue that separates the nostrils. A wide nasal septum is broad with rounded flared nostrils that point sideways. A thin nasal septum is narrow with irregularly-shaped nostrils that point downwards.

**Opposability** One digit of the hand or foot is able to cross over the palm to form a grip which uses force to oppose the other digits.

**Orbit** Spherical cavity or depression in the front of the skull housing the eyeball.

**Prehensile tail**