ADELAIDE ZOO

Adaptations

SECONDARY

ZOOS SOUTH AUSTRALIA

Government of South Australia
Department of Education and Children's Services

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.

Adaptations - Secondary

TEACHER INFORMATION

This trail includes studies on 5 species of animals. These are:

Australian sealion – structural adaptations

African wild dog – behavioural adaptations

A desert snake – physiological adaptations

Cassowary – various adaptations

Giant Panda – various adaptations

There is also a "Camouflage Spotto" which students can complete during the day using a variety of species.

The activities are discrete, so teachers should feel free to delete activities from the selection if concerned about time available. The first 3 activities listed above are recommended, to emphasise the different types of adaptations that occur.

Students are encouraged to work in groups, to discuss their ideas, to use careful observations of animals and their habitat enclosures, to read signage for information on distribution and habits of the animals and to ask questions if Zoo keeping staff are available.

<u>Pre-visit ideas</u>

- Research an animal species. Find out about its natural habitat, predators, food sources and the adaptations it has to help it survive.
- Make a list of all the adaptations humans have, compared to orangutans for example, and how they improve our chances of surviving in our environment.
- Consider trading places with a chimpanzee in the wild, and consider adaptations we would need to be able to survive.
- Group animals into the habitats that they come from, then compare adaptations that they have – looking for similarities and differences.
- Write one day of the diary of a chosen animal which is living in the wild. The writing should show how it uses its various adaptations to survive in everyday life.
- Explore the connections between inheritance of characteristics, variation in populations, the struggle for survival and adaptations of a species.
- Explore the pressures of a changing environment on adaptations of species, and the idea of evolution and extinction.
- Research disease resistance in terms of adaptations and evolution in disease-causing microorganisms.
- The following words and terms would be useful as prior knowledge to your visit to the zoo:

  Adaptation

  Environment

  Habitat

  Nocturnal, diurnal and crepuscular (active at dusk and dawn)

  Threatened species

Post-visit ideas

- Choose an animal to study in terms of its place in its ecosystem and adaptations that help it to survive and reproduce. Findings could be presented in a report , poster or pamphlet.
- Choose a species which is a “Threatened Species” and research reasons why it is now facing extinction despite all the adaptations which have helped it to survive thousands of generations.
- Compare and contrast adaptations of similar animal species from different habitats.
  Eg. Polar Bear vs Giant Panda
  Arctic fox vs Fennec Fox
  African elephant vs Asian elephant
  Cassowary vs Emu

Links to SACSA framework

Science- Life Systems

3.5 Explains the interrelationships between systems within living things, and between living things in ecological systems. They relate these ideas to the health of individuals and to threats to the sustainability of ecological systems. [F] [Id] [In] [KC1] [KC2]

4.5 Investigates and explains the functioning of living systems from the microscopic to the macroscopic. [F] [In] [KC1] [KC2]

5.5 Interprets and uses information about the structure and function of living systems and their relationship to survival of ecosystems. [In] [T] [KC1]

3.6 Identifies, analyses and communicates confidently the similarities and differences in the ways that living things reproduce, and considers the ethics of related issues. [F] [T] [C] [KC1] [KC2]

5.6 Applies theories and conceptual frameworks associated with evolution, biodiversity, genetics, and the cycling of energy and matter in biological and physiological systems. [In] [T] [KC1]

Society and Environment- Place, space and environment

3.4 Identifies and describes significant resources, explains the threats which endanger them, and suggests strategies to combat threats. [F] [In] [T] [KC1] [KC2] [KC6]

4.4 Describes places in Australia and elsewhere according to their location, natural and built features, and population and resources. Students explain interrelationships, including the effects of human modifications. [F] [In] [T] [KC1] [KC2]

5.4 Analyses and justifies personal views about similarities and differences between regions, in Australia and globally, identifying factors which shape dominant natural, sociocultural, political, economic and environmental contexts. [In] [T] [KC1] [KC2]

3.6 Identifies factors affecting an environmental issue, and reports on ways to act for sustainable futures. [F] [In] [T] [KC1] [KC2]

4.6 Identifies and describes ways that places and natural environments are valued or threatened, and discusses strategies related to ecological sustainability. [F] [In] [T] [KC2] [KC6]

Background notes for teachers and students on the day.

This trail is designed for students to work in pairs or in small groups.

Students will study 5 particular species during the day which are:

- Sealions
- African wild dogs
- A snake species
- Giant Panda
- Cassowary

They will also identify a number of other animals which they see during the day which are camouflaged in a particular way.

Students should read the background information at the start of the trail, then use the Zoo map to move around the Zoo to study the animals.

The order that animals are studied in does not matter, but the class will be booked in to the Panda Forest during a set time and students should ensure that they use that time for the Giant Panda observations.

Students are encouraged to discuss their ideas with their group, to use their observation skills, to read the signs and to talk to Zoo staff.

Key

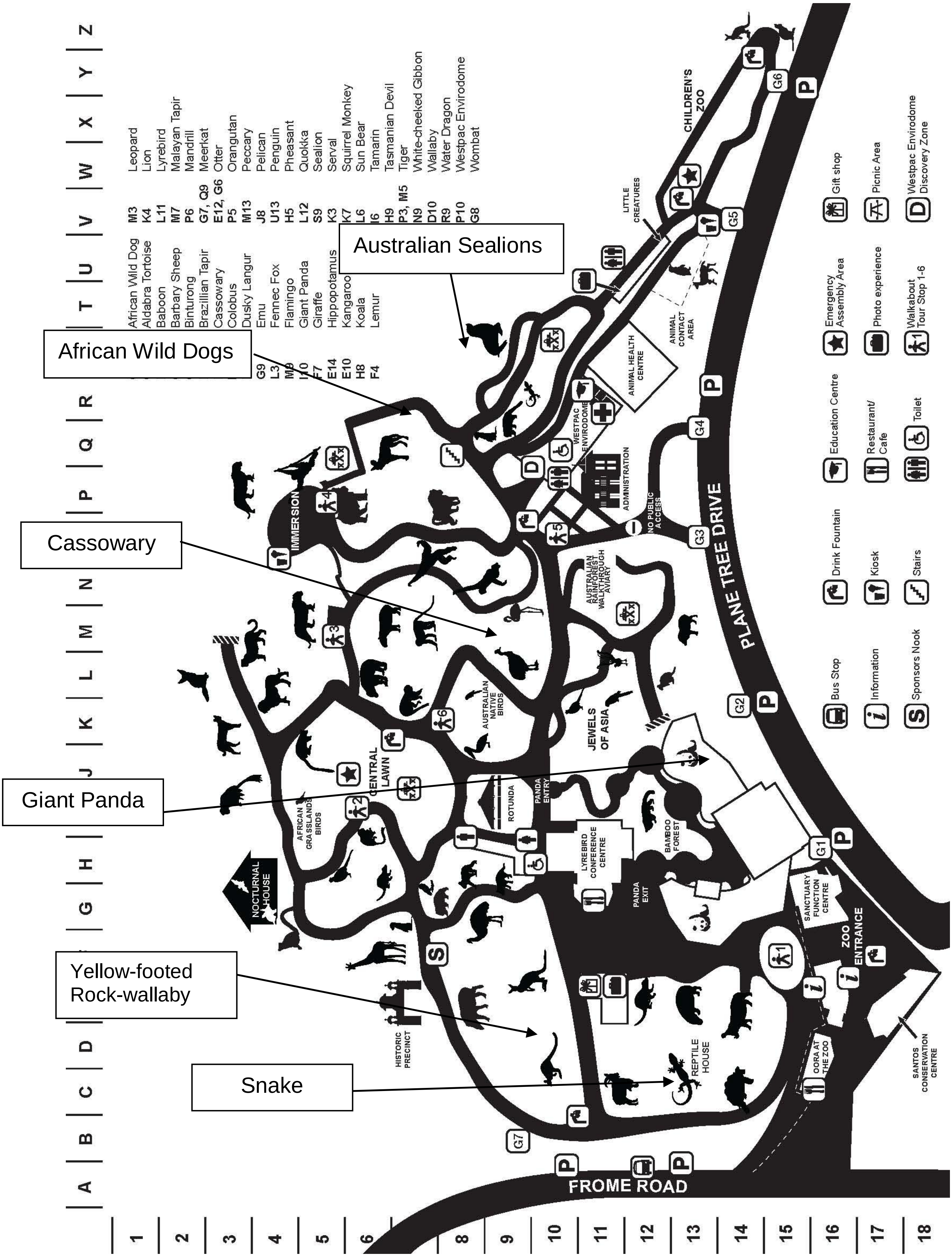
 Observe carefully

 Discuss and share ideas with your group

 Write / record your ideas

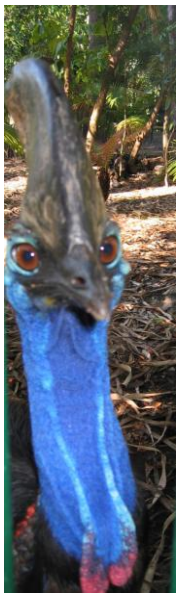
? Did you know?

 Challenge question



Australian Sealions
African Wild Dogs
Cassowary
Giant Panda
Yellow-footed
Rock-wallaby
Snake
PLANE TREE DRIVE
FROME ROAD
CHILDREN'S ZOO
LITTLE CREATURES
ANIMAL CONTACT AREA
ANIMAL HEALTH CENTRE
WESTPAC ENVIRODOME
ADMINISTRATION
NO PUBLIC ACCESS
IMMERSION
AUSTRALIAN RAINFOREST WALKTHROUGH AVIARY
AUSTRALIAN NATIVE BIRDS
JEWELS OF ASIA
CENTRAL LAWN
ROTUNDA
PANDA ENTRY
PANDA EXIT
BAMBOO FOREST
LYREBIRD CONFERENCE CENTRE
AFRICAN GRASSLANDS BIRDS
NOCTURNAL HOUSE
HISTORIC PRECINCT
REPTILE HOUSE
SANCTUARY FUNCTION CENTRE
ZOO ENTRANCE
OORA AT THE ZOO
SANTOS CONSERVATION CENTRE
Bus Stop
Information
Sponsors Nook
Drink Fountain
Kiosk
Stairs
Education Centre
Restaurant/ Cafe
Toilet
Emergency Assembly Area
Photo experience
Walkabout Tour Stop 1-6
Gift shop
Picnic Area
Westpac Envirodome Discovery Zone

ADAPTATIONS



?

A STRUGGLE FOR SURVIVAL…..

Living in the wild is a risky business. For all species, most of the animals that are born do **not** survive to adulthood.

How do they die?

- Eaten by predators
- Starvation – not able to find or catch enough food
- Drought , flood, extreme temperatures, fire, natural disasters
- Unable to find a suitable shelter
- Diseases and parasites etc..

Animals that are alive in the world today have been born to a long line of SURVIVORS AGAINST THE ODDS. How did they succeed where so many others failed?

All living things have adaptations which help them to survive and to reproduce in their particular habitat. Being well adapted does not guarantee survival, but it increases the chances.

Most adaptations can be described in one of 3 ways:

- **Structural** or Physical adaptations, where some part of the body is built differently. Eg. Large ears to assist heat loss, thick spiny hairs to protect against predators.
- **Physiological** or Body functioning adaptations, where the organism functions differently. Eg. Ability of some desert mammals to tolerate a much higher body temperature than most mammals could survive.
- **Behavioural** adaptations, where particular activities assist survival. Eg. nocturnal lifestyle, herd animals living in groups with many eyes and ears alert for predators.

AUSTRALIAN SEALION
Structural adaptations

Observe the Australian sealions in their day enclosure.
As in the wild, they spend enormous amounts of time swimming in salt water.

Discuss how hard it would be for **you** to live in the Southern Ocean, for most of the daylight hours of your life, eating fish and other sea animals.
What are some of the factors which would make it impossible for humans to survive this lifestyle?

- _____
- _____
- _____
- _____
- _____
- _____

Look for structural adaptations of the Australian sealions that would improve their chances of survival in the wild.
Describe and draw 3 of these features as accurately as you can.
Write a sentence about how each one helps it to survive.

Feature 1_____
_____
_____
_____
_____

Feature 2_____
_____
_____
_____
_____

Feature 3_____
_____
_____
_____
_____

AFRICAN WILD DOGS
Behavioral adaptations

?

- African wild dogs are “pack” animals. Packs of 40 animals once existed in the wild, but they are now an endangered species and packs are much smaller.
- Pack members need to stay together because they hunt large prey like Zebras; A team is needed to be able to drag down and kill prey animals.
- Only one pair in the pack breed : this pair is called the **alpha** male and female. Members of the pack fight when the pack is first established to decide which dogs are the strongest – these will be the alpha pair.
- When the alpha female produces a litter (often 10 -15 pups), all members of the pack help to feed and care for them.
- When the pack has killed and eaten prey, adults return to the den. Pups lick the face of the adults and the adults then regurgitate (vomit) the food for the pups to eat!
- An adult will not regurgitate food for a single pup: the hungry pup must stir up the other pups to join in the face licking before the adult will give up its food.
- Even when the pups are nearly full-grown, and join in the hunt with the adults, the adults wait till the young dogs have finished eating before they eat anything.

Observe the size and shape of the African wild dogs.

How do you think a pack of these animals could successfully kill a zebra?

_____

_____

_____

Predict what would happen if all females in a pack were able to breed.

_____

_____

Fighting can cause injuries which may cause an animal to get infections and perhaps even to die.

How could fighting for the right to breed be a behavioural adaptation?

_____

_____

<u>Challenge question</u>

Often people think African wild dogs, and other animals they see in the Zoo, are “lazy”. In the wild also, most carnivores rest when they are not hunting.

Is this “lazy” behaviour an adaptation? Explain your answer.

_____

_____

CAMOUFLAGE SPOTTO
To be filled in at various Zoo locations

?

Many animals use colour to help them to hide – from predators or prey.

Some types of camouflage are:

- **Blending** where the animal, if still, blends into the background and becomes "invisible" – eg. The African wild dog.
- **Disruptive** where the outline of the animal's shape is broken up by spots or stripes. – eg. The Yellow-footed rock-wallaby.
- **Counter shading** especially for swimming animals, where the upper surface is dark and the lower surface is light. - eg. Many ocean fish. From above it blends into the dark ocean depths, from below it blends into the glary ocean surface.
- **Mimicry** – where the colourings of an animal, combined with its shape, make it resemble something else: eg. A harmless snake coloured the same as a deadly one, or an insect which looks like a leaf.

As you move around the Zoo, fill in the table below for some animals in which camouflage is a very important adaptation.

Type of camouflage	Name of species	Description of colouring
Blending		
Blending		
Blending		
Disruptive		
Disruptive		
Disruptive		
Counter shading		
Mimicry		

SNAKE
Physiological Adaptations

?

Reptiles are very different physiologically from mammals:

Body temperature

Mammals use much of the food they eat (about 80%!!) to produce heat inside their bodies and to keep their core temperature constant. They are commonly called warm-blooded, but a better term is **endothermic** – meaning heated from within.

Reptiles are solar heated! They do not use food for generating heat: instead they absorb heat from their surroundings eg. By basking in the sun. They are **ectothermic –** heated from outside their bodies. It is not true to say they are cold-blooded, as this is only the case in cold weather. In warm weather they are warm-blooded! Reptiles cannot move quickly when their internal body temperature is cold.

Waste removal

Kidneys are important organs which remove wastes from the blood.

In mammals, this waste is mostly **urea** and this needs to be removed by dissolving it in large amounts of water. This mixture is called **urine** and is commonly 98% water.

Reptiles from dry areas produce the waste **uric acid**. This can be removed in a mixture with only a small amount of water. This waste looks like white paste.

In the Reptile House observe and describe a snake which originates in a desert environment.

Name of the snake_____

Short description_____

_____

As in all habitats, snakes of the desert are eaten by a variety of predators including carnivorous mammals, reptiles and birds of prey. It's dangerous leaving home!

Explain the advantages and disadvantages of being ectothermic like a reptile.

advantages_____

_____

disadvantages_____

_____

Would you expect to find more reptile species in the Northern Queensland rainforests or Tasmanian rainforests? Explain your answer.

_____

_____

Explain why excreting wastes by producing uric acid is a useful physiological adaptation for desert species of reptiles.

_____

_____

CASSOWARY
An impressive bird !

Carefully observe the Cassowary's feet.

Draw one foot, as accurately as possible, in the space here.

?

Adult Cassowaries have few natural predators, but their chicks are attractive food for a number of natural and introduced predators.

The Cassowary male protects and sits on the eggs, which were laid by the female, until they hatch. He then raises the young until they are fully-grown and independent.

Predict what would happen if you were in a tropical rainforest in Queensland or New Guinea, and you walked between a father Cassowary and his chicks.

Discuss reasons why the unusual "sole parenting" role of male Emus and Cassowaries could be an adaptation. ie. How could it help the **species** to survive?

Write down your ideas

Notice the "helmet" of the Cassowary.

How could this feature be a structural adaptation for this rainforest animal?

Most mammals do not have colour vision – they see in shades of grey.

Birds do have good colour vision.

How could these aspects of the Cassowary's colouring be adaptations?

a) Black feathers over most of the body

b) Bright red, white and blue skin showing on the neck?

GIANT PANDA
A very unusual bear!

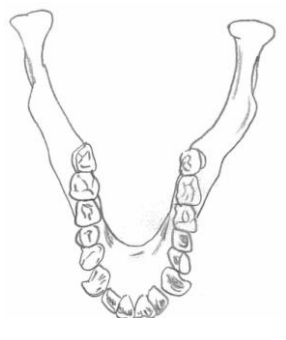
Observe a Giant Panda in its exhibit.

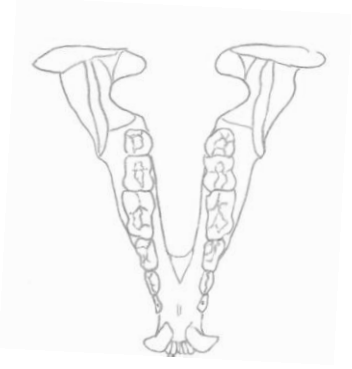
Sketch the Panda in the space below, showing the areas of dark and white colour. Label any significant body parts you can see like teeth, claws, eyes etc.

Pandas have a mainly vegetable (bamboo) diet. Yet being Bears, they are classed as "carnivores", and their ancestors were largely carnivorous.

Try to correctly label the 4 lower jaw diagrams below with the correct mammal species.

Choices are: Lion, Zebra, Giant Panda and Chimpanzee. (drawn to different scales)





_____ _____ _____ _____

Give reasons for your choice of the Giant Panda jaw.

Giant Pandas have amazing colouration, which you would expect to be clearly seen in the dark green mountain forests of their natural habitat.

In the winter, with a lot of snow around, would their colouring be an adaptation?

Explain your answer.

Observe the hand of a Giant Panda if possible.

You may notice a “thumb” which is used to help grasp bamboo shoots and other things. But if you count the clawed toes, you will find **five** toes **plus** the “thumb”!

The thumb is actually formed by a greatly extended wrist bone.

Explain why you think that Giant Pandas are the only bear species with this structural adaptation.

Challenge question

Consider a population of seed-eating birds which are very well adapted to their grassland habitat on a large island.

Imagine that the climate changes so that over a century the island becomes much wetter, with a forest, rivers and lakes becoming established.

Discuss how the adaptations of the population may change in terms of the

- **The struggle for survival,**
- **Offspring being similar to parents and each other, but not identical,**
- **The chances of different offspring surviving to reach reproductive age.**

Write down your ideas.