

ADELAIDE
ZOO



Desert Animals



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.

Desert Animals Trail- Secondary

TEACHER INFORMATION

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

- The Barbary Sheep
- The Pelican – a large aquatic bird which uses desert habitats during floods
- A nocturnal desert mammal – students choose from species in the Nocturnal House
- A desert bird – students choose from the desert species in the aviaries behind the Pelican enclosure
- A desert reptile – students choose a desert-living species from those on display in the Reptile House.

Students should first read the initial background information about adaptations and deserts. The animal studies which follow may be undertaken in any order.

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.

Pre-visit ideas

- Use average rainfall maps of Australia to identify the Desert regions (less than 150mm average annual rainfall.)
- On a map of the world, colour in the desert regions. Do these regions have any common geographical features? (eg. Latitudes, location of mountain ranges, oceans etc.)
- Compare physical features of an aquatic animal species and a desert species, and consider how these features may help the animal to survive their habitat.
- Research traditional Aboriginal desert dwellers and find out how they have been able to survive this harsh environment.
- Select a town in the Australian desert and find out why it exists and how its desert location effects the way it functions.
- Compare and contrast features of animals which have species living in desert and high-rainfall areas. Eg. Fox, snake, parrot, kangaroo.
- Research the difference in desert biological communities in drought and flood times.

The following words and terms would be useful as prior knowledge to your visit to the zoo:

Adaptation

Food web

Ecosystem

Environment

Habitat

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

Threatened species

Post-visit ideas

- Choose a desert animal and find out how its physical, physiological and behavioural adaptations help it to survive and to reproduce in this environment.
- Research the impact of feral animal species on Australian desert communities.
- Draw a food web, which includes at least 15 desert plant and animal species, to represent the interactions of organisms in the desert environment.
- Write an essay about being stranded in the Australian desert.

Links to SACSA framework

Science- Earth and Space

- 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 individually, in pairs or in small groups.

Students will study 5 species of desert animals. These include the Barbary Sheep the Australian Pelican and three others which are chosen from the Nocturnal House, the Reptile House and the Aviary block behind the Pelican enclosure (ie one from each of these 3 locations).

For the choice animals, check the species distribution maps to make sure they are species which live in the desert.

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 5 animals. The order that they are studied does not matter, but if the class is booked into the Nocturnal House during a certain time period, groups should ensure that they can fit the nocturnal animal study into their schedule at the right time.

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

Key



Observe carefully



Discuss and share ideas with your group



Write down your thoughts



Did you know?

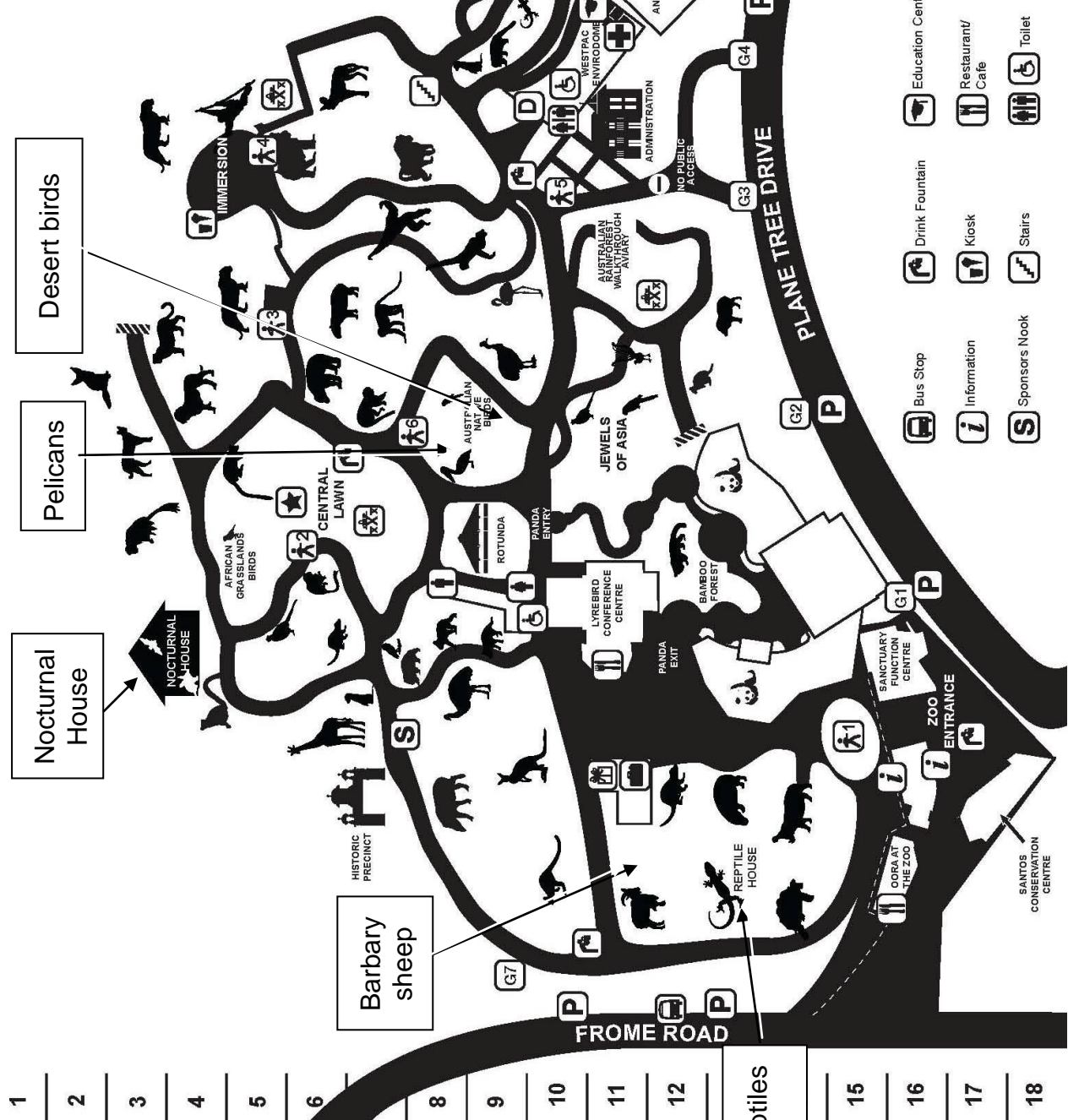


Challenge Question

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

1 | 2 | 3 | 4 | 5 | 6 | 8 | 9 | 10 | 11 | 12 | Reptiles | 15 | 16 | 17 | 18

- Q7 African Wild Dog
- C14 Aldabra Tortoise
- P8 Baboon
- C11 Barbary Sheep
- Q9 Binturong
- E8 Brazilian Tapir
- L9 Colobus
- I3 Lemur
- M7 Dusky Langur
- G9 Emu
- L3 Fennec Fox
- M9 Flamingo
- I10 Giant Panda
- F7 Giraffe
- E14 Hippopotamus
- E10 Kangaroo
- H8 Koala
- F4 Lemur
- 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



Leopard
Lion
Lyrebird
Malayan Tapir
Mandrill
Meerkat
Orangutan
Peccary
Pelican
Penguin
Pheasant
Quokka
Sealion
Serval
Squirrel Monkey
Sun Bear
Tamarin
Tasmanian Devil
Tiger
White-cheeked Gibbon
Wallaby
Water Dragon
Westpac Envirodome
Wombat

DESERT ANIMALS TRAIL – SECONDARY

Background Information

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DESERTS

Desert habitats are found in many parts of the world. They are areas where the average rainfall is less than 150 mm per year. In many deserts of the world this average is achieved by combining many years of severe drought with occasional years when flooding rains occur.

Most deserts are very hot during the daytime, especially in the summer time: at night, temperatures in deserts may fall dramatically. Deserts provide little shelter from the sun's heat, as few trees are able to survive the dry environment.



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CHALLENGES FOR LIFE IN DESERTS

Surviving in the wild is a challenge for all plants and animals, but desert habitats present some extra physical challenges for living things:

Water:

All plants and animals have bodies which contain mostly water.

Water is the fluid that transports nutrients and wastes through the bodies of plants and animals.

Wet surfaces are needed in living things for diffusion of gases into and out of their bodies. Evaporating water cools and can be used by plants and animals to prevent fatal over-heating.

BUT.....water in deserts is sparse and precious. So obtaining and keeping water provides a huge challenge for desert life.

Temperature:

Extreme temperatures also threaten life.

Most living tissue is damaged by temperatures above the mid forties or below 4°C.

“Warm blooded” animals (mammals and birds) require a very stable core temperature and normally die if this varies by more than a few degrees.

But..... temperatures in some deserts can be above 50°C for hours at a time during the day and may fall below zero at night.

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ADAPTATIONS

Despite all of the difficulties, thousands of species of plants and animals are found in the world's deserts.

How do they survive?

Desert-living animals have adaptations which help them to survive and to reproduce in this habitat, where a related species from a wetter habitat would quickly die.

Adaptations can be divided into 3 types:

- **Physical** or Structural adaptations, where some part of the body is built differently. Eg. Large ears to assist heat loss, light shiny leaves to reflect sun's rays.
- **Physiological** or functional adaptations, where the organism functions differently. Eg. Ability of a mammal to function normally at a core body temperature of 44°C. Ability of animals to survive without ever drinking water.
- **Behavioural** adaptations, where particular activities assist survival. Eg. Nocturnal lifestyle, living and breeding rapidly in desert areas only after heavy rains or floods.

Map of Australia's Desert area.

Most of the animals you will study are Australian. You should compare the distribution map for the species you are observing with the map below



A NOCTURNAL DESERT ANIMAL



You will study a desert animal which lives in the Nocturnal House.

It is hard to read and write in this location, so here are some things to observe and to think about while you are in the Nocturnal House. Once you are outside again you could complete the writing for this section. For best results in this area move as quietly as possible.

- Choose a **desert** animal (look at the current distribution maps to make sure they are from the desert habitat.) Some possibilities are Hopping mouse, Greater Bilby, Mulgara and Brush-tailed bettong.

Find out about



- The enclosure habitat, which is based on the animal's natural habitat
- Resting, nesting and hiding places
- Behaviour
- Current and Former Distribution (see map)
- What does it eat and what eats it? (see signage)



Name of the animal species you studied _____



All the animals in the nocturnal house are active at night and rest during the day. What are some advantages of this behaviour?

Describe adaptations which this species has which help it to live and breed in the desert environment, and explain how each of these adaptations helps.



Suggest reasons why this species' distribution is smaller than it was previously.





Challenge question:

The Echidna's distribution map indicates that they are still found throughout Australia: it has not become extinct in large areas like most of the other small mammal species.



Why? _____

AUSTRALIAN PELICANS

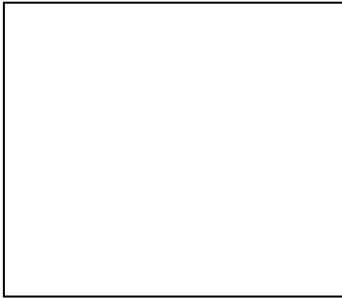


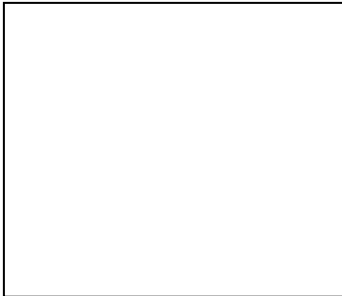
Observe and comment on the distribution map for Australian pelicans.





Carefully draw two structural adaptations, which Australian pelicans possess, which show that they are adapted to living and feeding in water. Next to each diagram, describe how the structure helps the pelican to survive or reproduce.



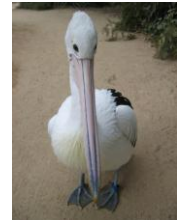


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Pelicans – desert birds???

“ ...
*I love a sunburnt country,
a land of sweeping plains,
of ragged mountain ranges,
of droughts and flooding rains,....”*

From “I love a sunburnt country” by Dorothea MacKellar, 1906



Several times per century, after Australia receives massive flooding rains, many inland waterways flow, eventually filling Lake Eyre, in the heart of the Australian desert .

The waters bring with them over 14 species of fish that have been washed out of flooded billabongs as well as many invertebrates, such as tiny shrimps, crabs, and bugs. Some of these hatch from eggs in the desert sand.

Algae grows in the water and is food for many of the invertebrates. Frogs which have been buried metres below the surface for years emerge and lay eggs, which quickly develop.

Tens of thousands of Australian pelicans (as well as other species of water birds) fly to Lake Eyre to breed, sometimes raising 2 clutches before the water dries out. Some of these birds fly thousands of kilometers to Lake Eyre. This breeding opportunity is important for these species. 90% of the baby pelicans born at Lake Eyre survive to fly back to coastal river and sea habitats.

Scientists do not know how Pelicans know WHEN to fly to Lake Eyre to breed. There are many theories about how they do it. Some of these hypotheses are:

- Bird talk
- In-built magnetic compasses
- The ability to hear vibrations of thunderstorms from long distances
- They can smell the huge expanse of inland water
- They sense the change in atmospheric pressure associated with heavy rain
- The older birds who have bred on Lake Eyre may lead the young ones



What do you think is the most likely possibility?



Is there any way your idea could be tested? Explain



Pelicans fish in groups, swimming in formation to trap schools of fish, then dipping in their beaks at the same moment to scoop them up.

What are the advantages and disadvantages of this behavioural adaptation?



advantages _____

disadvantages _____

Pelicans normally lay 2 eggs, a few days apart. The first one hatches a few days before the second and grows quickly, so it is much bigger than the second. If there is a shortage of food, the older chick often kills the younger one.



Challenge question :

Do you think that this behaviour is an adaptation? Explain





A DESERT BIRD

The block of aviaries at the back of the Pelican enclosure (opposite the Cassowary) contains many bird species. Using the distribution maps, choose a bird species, which is clearly visible, whose natural habitat desert.

Some possibilities are: Bourke's parrot, Crimson chat, Budgerigar, Cockatiel, Pied Honeyeater

The aviaries are set up to be similar to the natural habitat of the birds.



Name of bird species chosen _____

Use your observations of the enclosure and the information on the sign to help you to explain how this species of bird is able to survive (eat, drink, shelter, nest, reproduce and avoid predators like hawks, snakes, goannas, foxes and cats) in the desert environment.



Comment on the colouring of this bird and its significance.



Draw a foot and the beak of this bird, as accurately as possible, and describe how their shape would help the bird in its natural environment.



foot



beak



BOOM OR BUST BREEDING CYCLES

Species of birds from most Australian habitats have a similar breeding cycle from year to year. During the breeding season, the population size may double or triple, but most of the babies, and some of the adult birds will die during the year, and the total population at the start of each breeding season is about the same.

Desert birds generally don't breed until there has been heavy rainfall, which causes the desert to "bloom". Plants, which have not been seen since the last heavy rains, quickly germinate, flower and set seeds. The huge increase in plant numbers is quickly followed by breeding of most desert animal species. Birds may produce more than one clutch of chicks while the good food supply lasts.

This "Boom" time does not happen every year, but depends on when the heavy rains fall. During drought years, or "Bust" times the bird numbers may drop down to very low levels as food and water supplies diminish.

What is the advantage, for the desert birds, of breeding in this "Boom or Bust" cycle?



Write down or draw a food chain, which starts with a plant species, finishes with a predator, and includes the bird species you are studying.



Decomposers are an important part of all food webs. They eat the dead bodies or animal waste, and return the minerals from them back into the soil.

What decomposers would break down the material from plants and animals that have died in the desert habitat?



Dead plant decomposers _____

Dead animal decomposers _____




Challenge question :

Explain what would happen to life in the desert if decomposers did not exist.

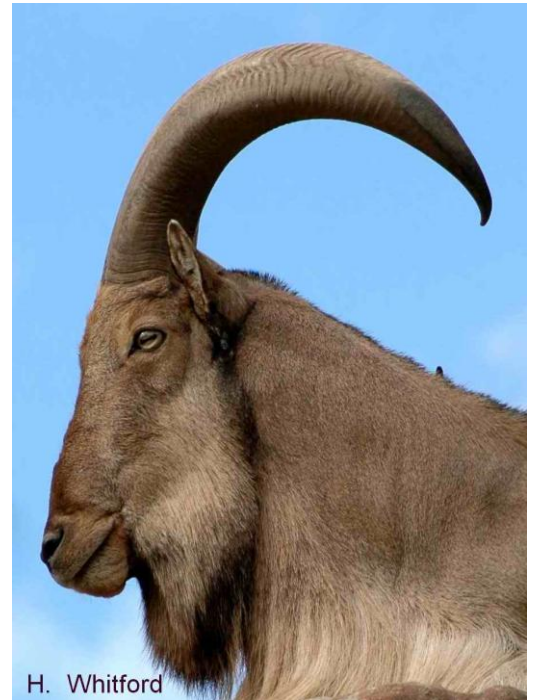


Barbary Sheep

 The natural habitat for the Barbary Sheep is the dry, mountainous country of arid North Africa.

How could the colouring for this species be an adaptation?





All of these animals have heavy horns which start growing soon after birth. Can you think of several uses for these horns? (hint: how do tight-rope walkers use the long pole they carry?)





Like many species of desert animals, the Barbary sheep can go through its whole life without drinking water. Its body can obtain water by

- Eating succulent plants and food like melons
- Retaining **respiration water**: ie. when body cells respire (burn up) food for energy, they always produce water and carbon dioxide. The carbon dioxide must be breathed out, but the water may be kept in the body if the animal
 - Loses little water in its urine and faeces
 - does not use water to cool off (sweating or panting.)

Barbary sheep are “crepuscular”, which means they are active in the morning and evening and rest during the heat of the day.

This adaptation would be described as (circle the correct one.)

PHYSICAL

PHYSIOLOGICAL

BEHAVIOURAL



Challenge question :

Look carefully at their enclosure at the Zoo and see if you can work out how these animals are safely managed by Zoo keepers, and how they can be captured safely for treatment or moving between Zoos.





DESERT REPTILE



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Reptiles are Solar Powered!

Like mammals and birds, their bodies function best when they are warm.

But, unlike mammals and birds, they do not burn up food to enable their body to be constantly warm. (About 80% of the food you eat is used to keep your body temperature just right!)

“Warm blooded” animals are **endothermic** (meaning they are warmed from inside), but reptiles and so-called “cold blooded” animals are **ectothermic** (warmed from the outside.)

Reptiles use heat from the sun and their surroundings to warm their bodies to the right temperature. In cold surroundings they become sluggish and are vulnerable to predators, so they hide or hibernate.



In which parts of the Earth would you expect to find most reptile species?

In the Reptile House, choose a desert reptile you can see clearly (look at the distribution maps to make sure they are from the desert habitat.) Some possibilities are Desert death adder, Ridge-tailed monitor, Woma python and Gila monster.



Draw a diagram of the animal you chose in the space below. Mark in and label all distinguishing details, markings, body parts etc.

Name _____



Is this animal's colouring an adaptation? If so, explain how it helps.



Explain how this animal finds and captures its food.



Being ectothermic (solar powered) is a physiological adaptation of reptiles.

What is one important advantage of being ectothermic, and one big disadvantage?



Advantage_____



Disadvantage_____



Challenge question :

Forked tongues are a structural adaptation found in snakes and some species of lizard. How do these tongues help the animals to locate their prey?



