Episode Five: Deserts

Deserts cover a third of the world’s land surface but they are very different in character. This episode starts in one of the most extreme, the Gobi Desert of Mongolia which lies in the rain shadow of the Himalayas. This is far from the common idea of desert, searing hot in summer and a freezing, dry landscape lightly dusted with snow in winter, it contains the last groups of wild bactrian camels which cruise the frigid slopes in search of food and mates.

From far above, we see the strange effects of the desert winds in the Sahara as the sand scours rocks into unearthly shapes. Old limestone seaboards are carved into isolated white blocks teetering on thin pedestals as huge sandstorms lasting for days chew away at them and blast the single-humped camels and other creatures that survive out there. In the Namib of southern Africa, monster sand dunes have been formed by the winds and elsewhere mountains are reduced to pyramids and spires before being erased completely.

Animals that live in hot and arid environments must adapt. Kangaroos seek shelter in the heat of the day but also must lick themselves to cool down or risk heat death. African fennec foxes come out of their burrows only at night as do many of their nocturnal prey species.

The driest desert is the Atacama region of Chile. No rain falls for up to fifty years but the coastal edge can support life, dependant on fog and dew from the ocean for water. So, unlike further inland, cacti may grow and guanacos graze. In the Sonora Desert of Arizona, the huge saguaro cactus acts as a reservoir for the infrequent rains and we see their pleated stems swell in time-lapse photography as they take up huge quantities of water from an infrequent shower. These cacti are flowering plants but their flowers open only at night as they are pollinated not by insects but by migrating bats that can make the journey using the nectar as fuel.

Nubian ibex, a wild goat with massive horns, fight for the right to breed in awesome head butting contests, the losers condemned to life on the margin as the group wander in search of boughs. Rainbow coloured flat lizards make their home by a water-course to take advantage of the clouds of black flies that they catch with acrobatic leaps into the air. Elephants trek along dry watercourses in the Namib, digging up grass roots as they are more nutritious than the dry surface stems while small groups of lions survive by hunting the oryx when they come off the dunes to feed.

But it does rain in the desert some times. Flash floods fill the dry water-courses and the water soaking into the ground provides enough for flushes of green growth. Arid areas of Death Valley suddenly burst into bloom as short lived plants grow, flower and die in a few weeks the seeds of these ephemerals may have been waiting for up to a century for rain before they could germinate.

Nature responds to this spurt of growth with the most voracious eating machine on earth, the plague locust. We join the swarm as the hoppers feed up quickly, get their wings and take to the skies. Gliding downwind in a swarm up to forty kilometres wide and consuming every edible green morsel in their inexorable journey.

Web Resources

Desert formation
http://www.nps.gov/moj/mojadewd.htm
http://library.thinkquest.org/C001323/data/formation.html

Desert ecosystems
http://helios.bto.ed.ac.uk/bto/desbiome/biome.htm
http://www.oneworldjourneys.com/sonoran/index2.html

Species list

- Bactrian Camel Camelus bactrianus
- Dromedary (Camel) Camelus dromedarius
- Red Kangaroo Macropus rufus
- Fennec Fox Fennecus zerda / Vulpes zerda
- Sahara Toad Bufo regularis
- Guanaco Lama guanicoe huanacu
- Saguar Cactus Carnegiea gigantea
- Gila Woodpecker Melanerpes uropygialis
- Long-nosed Bat Leptonycteris curasoae
- Long-tongued Bat Choeronycteris mexicana
- Nubian Ibex Capra nubiana
- Flat Lizard Platysaurus broadley
- African Elephant Loxodonta africana
- Lion Panthera leo
- Oryx Oryx gazella
- Plague Locust Schistocerca gregaria

[Timings are approximate]
1. What proportion of the earth’s land is desert?

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2. What is the temperature range in the Gobi Desert highest to lowest?

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3. What is the difference between a bactrian camel and a dromedary?

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4. How do the bactrian camels get water in winter?

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5. How many of these strange camels are left in the wild?

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6. What is the main form of erosion in the desert?

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7. Where are the biggest sand dunes in the world?

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8. How does a red kangaroo keep cool?

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9. How do the fennec foxes avoid the heat?

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10. What other animals only come out at night?

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11. How often does it rain in the Atacama Desert?

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12. How do guanacos get water?

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13. Where does the water in the Atacama Desert come from?

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18. What do the elephants of the Namib Desert eat?

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19. Why do the oryx go out on the sand dunes?

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14. How can the saguaro cactus take up so much water?

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15. Which animal pollinates the flower of the saguaro?

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16. Why do ibex fight?

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20. What is a hopper?

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17. Why are the flat lizards flat?

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Desert Formation

Deserts take up one third of the planet’s land area and while some are the result of human impact, most are caused by natural climatic effects. As we have seen in this series, most of the world’s rain comes from evaporation from oceans sweeping in air masses over the land and causing rain. There are several ways that deserts occur naturally.

Rain Shadow these are areas where there is a mountain range between the coast and the inland. The mountains force the moisture laden air from the coast upwards (Orographic Lift). This cools the air and moisture condenses, falling as rain on the mountain slopes. By the time winds reach the ‘lee’ side, they are much drier. This is a common effect but in some areas very little precipitation reaches the shadow areas. Death valley in the USA (Arizona) is a good example.

Inland or Continental Deserts Some areas are so far inland that almost no humid air can reach that far without losing its moisture first. The Gobi is an example although it is also in the Himalayan rain shadow.

High Pressure Deserts in parts of the world where there are almost permanent high pressure conditions, moisture bearing low pressure air cannot penetrate the area. The Sahara is a northern example and the Australian central desert is a southern example although both are also continental.

Coastal Deserts Where there is a cold offshore current in a warm zone, the current blocks normal evaporation processes. Most rain falls just offshore as humid air cools over the cold water. The Atacama is a model example and also has the typical ‘fog desert’ zone on the coast.

Polar Desert The poles are cold, high pressure zones. If the mean summer temperature is below 10°C then dry conditions occur with bare gravel in summer and snow dunes in winter. Some Antarctic valleys are so dry that dead animals are mummified rather than decaying.

Research Activities

- Select two different types of desert and select a good example of each. Prepare a research report, PowerPoint presentation or poster demonstrating graphically exactly how these deserts are created.

Desert Adaptations

Animals and plants have to adapt to live in the desert. Animals will show many behavioural adaptations such as nocturnal lifestyle, midday resting, burrowing, etc. Many Australian mammals will wriggle into Spinifex grass tufts where the temperature is lower. Physical adaptations include things such as nocturnal eyes, large ears to radiate heat and cool blood (fennec fox, some rabbits and hares) and recovering all water from faeces (dry droppings). Others aestivate the opposite of hibernate. Small fish and frogs in Australian desert lakes and river beds encase themselves in mud cases and sleep until the lake refills and dissolves the casing.

Plants are even more interesting. Some actually dry out totally and look dead; Resurrection plants such as the tumbleweeds which break away from their roots, form a loose ball and blow in the wind until they hit water, possibly years later and put down roots. They come back to life.

There are many Ephemerals, plants which have long lasting seeds. It may rain once in over twenty years but these seeds immediately germinate. The plants have a short time before the water dries up or soaks away so they compress growing, flowering and setting seed into just a few weeks. Desert blooming like the instance in this episode are very short events.

Some plants like tough desert grasses have very long roots to reach deep water or thick rhizomes to hold water as long as possible. Sturt’s desert pea is only 10cm high but has roots up to 10m deep! Many monocots have bulbs plants such as lilies and onions. These store water for recovery after drying off or provide enough energy to flower and seed, even after the water is gone. The mallee eucalypts of southern arid areas of Australia have large, woody underground lignotubers mallee roots which help them survive drought and bushfire. The tops die but they reshoot immediately.

With rain, the desert suddenly comes to life but this does not last more than a few weeks.

Research Activities

- Prepare a graphic presentation of a single desert animal or plant or group, indicating the arid zone adaptations with annotations (long labels).
Discussion Questions

1. How do animals survive in the desert? What sorts of adaptations and behaviours help them?

2. What forces cause and shape the desert?

3. How can an area be called a desert if it is covered in ice or snow?

4. In deserts we see life centred around open water holes and creeks. Where does the water originate?

5. What ways can plants and animals store and hold water for long periods?

Extension Tasks

A. Deserts are spreading across the world. Investigate the many and complex reasons for this problem.
B. Research some of the Australian animals that aestivate and the way that they go about it.
One third of the earth's land is desert.

1. Mark the deserts mentioned in this episode on the map with their names and the area covered. Use an atlas to locate their exact position, size and shape.
2. Investigate a desert type: Rain Shadow or Coastal. Give two examples of that type and draw a cross-section diagram showing the mechanism that prevents precipitation reaching it.

Research Activities

A. Prepare a poster or PowerPoint presentation on a specific desert. Include details of the geographic and climatic forces at work and any special features of that desert.
B. Humans manage to live on the fringes of deserts or even in them. Investigate a group of desert dwellers and write a report on their lifestyle and the ways that it helps them to survive. (Examples: the herders of the Gobi, the Bushmen (Xung) of the Kalahari, the Toureg and Bedouin of the Sahara.)