



Biodiversity trail

What is biodiversity?

The term Biodiversity refers to the variety of all living organisms, from microscopic bacteria to giant redwood trees. It includes the variety of genetic information available within a species. The interrelationships between organisms are also an integral part of biodiversity. Organisms have evolved over time to develop different adaptations to survive in their habitats and niches. These adaptations contribute to the diversity of life on earth.

There are many biodiversity hotspots across the globe which includes ecosystems such as rainforests, coral reefs and seamounts. These ecosystems contain the greatest proportion of the Earth's species although we only know about a few of them.

Biodiversity trail

This trail will take you on a tour of the diversity of life here at Marwell and allow you to discover more about biodiversity and its importance to us.

Use the map provided to help you follow this trail.

You will need to look for signs near the enclosures to help find the information you need. You may also need to use your own knowledge or observational skills to work out some answers.

1. Humboldt penguin



Humboldt penguins are named after the Humboldt Current which runs past the coasts of Chile and Peru where these birds live.

Whilst the most familiar penguin species are found in colder climates, the Humboldt penguin originates from a more temperate climate.

1. a) Look at the different penguin species pictured around penguin cove. How many different species of penguins are there?

1. b) What adaptations do Humboldt penguins have which allow them to be successful in the ocean environments they spend most of their time in? (Choose two).

2. Greater flamingo

Greater flamingos live in highly saline water (high concentrations of salt) and alkaline habitats such as estuarine lagoons and mangrove swamps.

2. a) What level of biodiversity would you expect to find in such harsh conditions? Why?

2. Greater flamingo continued

2. b) What adaptations can you see that might help greater flamingos to survive in these environments?



2. c) Why do you think we sometimes play the sound of flamingo flocks into the flamingo enclosure?

3. Cheetah

About 10,000 years ago, all but one species of cheetah (*Acinonyx jubatus*) died out. Only a few individuals survived, from which all of today's cheetah are descended.



The breeding of close relatives in this **founder population** has resulted in today's cheetah sharing approximately 99% of their genetic information, compared to about 80% for most species.

This means that there are very few alleles (different forms of the same gene) within the remaining global cheetah population.

3. a) What problems can this lack of genetic diversity within the cheetah population cause?

4. Heart of Africa

As you enter Heart of Africa, on the right hand side you will notice a board showing the huge diversity of antelopes that there are.

4. a) What factors have determined the huge variety of shapes and sizes of antelope that have evolved?

If you walk over to the other side of Heart of Africa you can see a range of antelope horns, which further illustrate the diversity of antelope.

Now look at the cichlid fish from Lake Malawi (back wall of Heart of Africa).



4. b) How are so many different species of cichlid fish able to survive in the same lake?

5. Lemur loop

Marwell Zoo is home to five species of lemur. In our Lemur Loop area, you can find three of these species. Lemurs are endemic to the island of Madagascar. All lemurs evolved from a common ancestor and adapted to the variety of habitats found on Madagascar. Over time they have evolved into over 100 different lemur species which can be found on Madagascar today!



5. a) Look at the ID signs and list the three species of lemur housed in this enclosure.

1. _____

3. _____

2. _____

5. Lemur loop continued

If a species is **endemic** it means that it is only found in a particular habitat or location and it is not found anywhere else in the world.

5. b) Why is it important to conserve the habitats where these endemic animals are found?

6. Amur leopard

Many species are threatened by human activities – the Amur leopard is one of these threatened species.



6. a) Circle the correct IUCN conservation status of the Amur leopard on the scale below.

NOT EVALUATED	DATA DEFICIENT	LEAST CONCERN	NEAR THREATENED	VULNERABLE	ENDANGERED	CRITICALLY ENDANGERED	EXTINCT IN THE WILD	EXTINCT
NE	DD	LC	NT	VU	EN	CR	EW	EX

6. b) Identify two threats to the Amur leopard in the wild.

Conservation efforts to try to protect Amur leopards from extinction include anti-poaching patrols, education schemes, and captive breeding programmes.

7. Okapi

The okapi is a large mammal (almost 2 meters tall!) and lives in the Ituri Forest of the Democratic Republic of Congo, in Central Africa.

The okapi was not known to European scientists until 1901 because it is such a shy and elusive animal.



7. a) What does this tell you about our current knowledge of the biodiversity of life on earth?

7. b) What activity is currently threatening the forest habitat in which the okapi live? What is the product of this activity used for?

8. Energy for Life: Tropical House

Despite covering less than 10% of the earth's land area, rainforests contain over half of the world's plants and animal species making them incredibly bio-diverse.

The level of bio-diversity in an area is an indicator of how healthy the habitat is; the more bio-diverse an area the healthier it is considered to be. Scientists conduct many biodiversity surveys in the same area, throughout different seasons and over years to monitor the health of the ecosystem.



Energy for Life: Tropical House continued

8.a) As you enter the Tropical House, estimate how many different species there are in the main room.

Estimated number of animal species:

Estimated number of plant species:

8.b) Use the tablets on the pathways to find out how many animal species are actually housed in the Tropical House (you will have to count).

Number of animal species:

Number of plant species:

(Please inform your group of the number of plant species housed within the Tropical House).

It is likely that your estimate and the actual number of species is different. This is why it is important to complete rigorous ecological surveys to achieve more reliable results about the biodiversity of habitats. It is not only the number of species that should be considered, but also their abundance. The Simpson's biodiversity index covers both of these things and results in a value between 0 and 1 to show if an area is actually bio-diverse or if it just seemed that way in the raw data. The equation is shown below.

Simpson's biodiversity index:

$$D = 1 - \frac{\sum n (n - 1)}{N (N - 1)}$$

Where **D** is the value of the index (a number between 0 and 1 with 1 meaning the area surveyed is infinitely diverse)

Σ is the 'sum of'

n is the number of individuals of the same species

N is the total number of all individuals

Energy for Life: Tropical House continued

8.d) Use the raw data that you collected in 8b to work out the Simpson's biodiversity index for the Tropical House.

$$D = 1 - \frac{\sum n(n-1)}{N(N-1)}$$

D=

The higher the value of D the higher the level of biodiversity

8.e) How could you make your results reliable when calculating Simpson's biodiversity index in the field?

9. Binturong

The binturong, also known as the bearcat, is a member of the viverridae family, which includes civets. Despite its appearance, the binturong is very agile and easily moves through the trees, high up in the canopy of its forest home. The binturong inhabits primary (forests untouched by human activity) across South East Asia.



9.a) One of the major threats to the binturong is deforestation and logging. Why do you think this type of human activity affects the binturong population more than some other species in the same habitat?

9. Binturong continued

9.b) One of the reasons the binturong's habitat is being destroyed is to clear areas for palm oil plantations. Palm oil is an ingredient used in many processed foods. What changes in your own life can you make to help reduce this impact on the binturong habitat?

10. Capybara

Capybara are the world's largest rodents, they inhabit areas close to water including marshes, and forest or grassland areas along rivers or streams.



10. a) How are capybara adapted for this lifestyle?

10. b) i) How is the growing of single crops on large grassland areas in South America affecting capybara?

10. b) ii) What could you do to and how it would help?

11. Summary

On your journey around Marwell you have looked at just a small sample of the millions of plant and animal species that exist on earth.

11. a) Why do you think it is so important for humans to take steps to preserve the biodiversity of our planet?

11. b) What steps could we take to help preserve biodiversity?

Well done! You have completed the Biodiversity Trail; now see what other animals you can see around the zoo.

Biodiversity Trail



1. Humboldt penguins
2. Greater flamingo
3. Cheetah
4. Heart of Africa
5. Lemur Loop
6. Amur leopard
7. Okapi
8. Tropical House
9. Binturong
10. Capybara

KEY

-  Information
-  Toilets / disabled & baby change
-  Changing Places facility (Radar key required)
-  Café Graze & Coffee Corner - Open all year
-  Outdoor picnic tables
-  Seasonal refreshments Ice creams / coffee
-  Penguin Station rail train
-  Road train stops
-  Adventure playgrounds
-  Under cover area
-  First Aid Emergency? Call: 01962 777983

 **Science & Learning Centre**
Pre-booked education groups or special events

 **Marwell Hall**
Special events & private bookings