Desert

Desert Biome

A habitat with strong contrasts

The desert (from the Latin *deserere*, to abandon) is a habitat with poor rainfalls. In many deserts, the annual rainfall is below 50 mm, but it can even be zero. In this ecosystem, the shortage of water is the main ecological factor affecting vegetal and animal life.
As well as the shortage of rains, it is also its variability over the year that strongly affects life: for comparison, just think that rainfalls in Europe vary by 20% over the year, while in Sahara this variability reaches 80-150%. This involves occasional violent downpours during which it can rain more than over several consecutive years.
Deserts may be either cold or hot. Cold deserts are at high altitudes, where winter temperatures can be below zero, such as the Gobi Desert, protected by the air masses bringing rain from high mountain ridges.
In hot deserts, the atmospheric temperature during the day can reach 50℃, while the surface temperatu re of the sand can rise to 90℃. At night, the ground and the air q uickly cool down, with temperature differences of over 20℃.
In such a inhospitable environment, all the living beings must adapt themselves: to make up for the shortage of water, the most varied forms of adaptation have developed, even if biodiversity is still low, since between 20 to 400 plant species can be found in 150,000 square kilometres (one half of Italy).

World deserts

Deserts extend from the 20th northern parallel to the 20th southern parallel. 15% of all lands above sea level are considered medium dry, another 15% dry and 4% extremely dry. Extremely dry deserts have no rainfalls at all for periods of over one year. This is typical of real deserts, such as the Sahara, part of the Arabic desert; the Mojave desert in North America; the Namibian desert and part of the Kalahari; the Atacama desert in Latin America; the Gobi desert in Asia and part of the Australian desert. Dry and medium dry deserts, with comparatively more abundant rainfalls and shorter droughts, include part of the Kalahari and the Karoo desert in South-Africa; in Asia, the Arabic and Middle Eastern desert, the Iranian desert, the Touran, the Indian, Tibetan and Mongolian desert; in North America, the Mexican Chihuahua desert; the Patagonian desert in Latin America and a large part of the Australian desert.

Oases

An oasis generally forms where a water table is closer to the earth's surface so that the water that can let life develop comes to the surface. Occasionally, oases are artificially made by digging wells, even to a depth of a few kilometres, to reach the water table from which water can be taken later with a pump or bucket.
The vegetation of these habitats generally consists of date palms and small vegetable, fruit and cereal plantations. They need water, which is channelled and brought to the vegetable gardens of the oasis. Oases need man to take care of it, since it risks disappearing buried in the sand that slowly settles on them during sandstorms. Protective belts have been put in place at present, even if only in the richest areas, while elsewhere the oases are protected by barriers made of palm branches.

Plants of the desert

The vegetal life of the desert comprises annual, ephemeral and perennial species.
Annual plants
Annual plants are all those plants, mostly herbaceous, having a life cycle of less than a year, such as, for instance, the *Panicum turgidum* which is an evergreen plant in moister alluvial soils, while in dry areas it becomes a deciduous plant, i.e. a plant that loses its leaves.

Ephemeral plants

Ephemeral plants are those plants that are born only after occasional rains and reproduce and die before a new drought comes, and they typically have therefore an extremely short life cycle, for instance the *Alyssum alyssoides*.

Perennial plants

Perennial plants must instead be able to survive in dry conditions, by minimising the loss of water during the hottest periods. These plants are normally xerophytic, which means they have leathery leaves coated in a waxy film and closed stomas to reduce transpiration and evaporation. Many plants have a reduced foliar surface or have turned their leaves into thorns, especially to avoid losing fluids, as well as to protect themselves from herbivores. These plants can trap great amounts of fluids within their tissues. This is the case of the succulents, such as the American cactus (Cactaceae) and the African and Asian euphorbia (Euphorbiaceae), which are ecological homologous species. In both cases, these plants have turned their leaves into thorns and the photosynthesis has been moved to the trunk tissue which, for this reason, always looks green because of the presence of the photosynthetic pigment.

In the desert, perennial plants generally grow very slowly because of the unfavourable environment in which they live and live very long to make up for regenerative problems. An impressive example is the *Welwitschia mirabilis*, a primitive plant related to the conifers, **endemic** of the Namibian desert, which has an extremely slow growth rate and lives to a ripe old age: the oldest specimen ever found is 1,500 years old. This plant has a small, woody trunk from which only two ribbon-like leaves sprout and grow slowly and relentlessly along the sandy ground. At ten years of age, the leaves measure just a few centimetres. Both ends of the plant come undone, so that it looks like it has a lot of leaves. Green female flowers and red male flowers grow in the middle. Plants growing in oases are different and are called **phreatophytic** because they have extremely long roots that absorb moisture from the water table. This is the case of the date palm (*Phoenix dactilifera*) growing in the Saharan and Middle Eastern oases.

Animals of the desert

Impressive cases of adaptation to this inhospitable habitat, where heat and drought are the main limitations to the development of life and also to the availability of food, can also be found in the animal kingdom.

During the summer or particularly long drought periods, some desert animals "**aestivate**", i.e. they reduce their activity by hiding under the rocks or underground, just as, in milder climates, many living beings hibernate in winter. Aestivating animals include, for instance, some species of reptiles and the desert snails which come to life only after rains: when moisture decreases, they hole up in their shells waiting for new rains in a dormant state that can last up to five years. Butterflies, coleopters and desert cockroaches also adjust their life cycles to rainy times: the larvae come out of their eggs only when there is more food around after the rains.

Reduced activities can also be found during the day, especially at the hottest mid-day hours when all animals take refuge in the shadow.

Some large animals, such as ungulate mammals, carnivores, birds and flying insects, wander away or migrate to move from hotter and drier areas to more hospitable ones. For instance, the sand-grouses, partridge-like birds, move every day to go and drink in the oases or wherever they may find water. These birds can even drink brackish water.

Desert formation

A desert forms when there has been a shortage of rain for a long time. It may have different geological conformations - mainly due to the effect of the wind (wind erosion). There are sand deserts, called **erg**, rock deserts, called **hammada**, and pebble deserts, the **serir**.

The history of a desert can be studied through palaeontology. During the Pleistocene (1 million years ago), where there are deserts now, rainy periods followed each other during the glaciations, while dry periods followed each other in warmer times. This is proven by the stratigraphical sequence of the land and the variations of the level of the waters of some lakes that still exist today. For instance, Lake Chad in the Sahara desert used to be much larger and 120 m deeper than it is today.

In more recent times, at the end of the last glaciations, the climate of some areas which were constantly submitted to

high pressures determined the spreading of the deserts.
In other instances (the Patagonian medium desert in the Andes), it was the presence of mountain ridges that acted as a barrier against the wet currents coming from the oceans and that determined the conditions that favoured the development of the desert. Clouds are actually stopped by mountains and therefore they let rain fall on the first side they bump into, while "at the back" it rains very little.
The cold oceanic currents have also originated some dry areas: they generate cool and constant winds carrying little humidity which can at most condense into fog without causing any real rain. For instance, the coastal desert of Peru and northern Chile washed by the cold Antarctic current of the Hudson and the Namib desert, washed by the Antarctic current of the Banguela.
In addition, winds are responsible for the ongoing reshaping of the landscape: they play a key role in that there's virtually no vegetation at all and the ground is easy to attack. In addition, their erosive effect is enhanced by the sand acting as an abrasive agent. The most spectacular results of the action of the winds are eroded and polished rocks in the most bizarre shapes.
Dunes are also generated by the wind that builds and "moves" these sandy mountains around; the draughts lift the grains and settle them down again when friction increases. The shape of the dunes mostly depends on the direction and variability of the wind; there may be parabolic, dome-shaped, boat-shaped, crosswise , straight, opposing or star-shaped.

The long history of the Sahara

The origins of the Sahara desert, the largest hot desert and the largest desert in the world, date back to approximately 600 million years ago. The sea submerged the region over and over again, depositing its sediments; whenever it resurfaced, it was alternately covered by forests, savannahs and even marshlands. During that time, trees, such as oaks, cypresses, olive trees and Aleppo pines, grew in the area. Approximately 50-55 million years ago, these lands surfaced once and for all and the land started to get dry, as many finds still attest: shells, trunks now turned into stone after a long silicification process, wall paintings and graffito portraying the typical fauna of the savannah.

The dinosaurs of the Gobi

The Gobi desert, at the south-western tip of Mongolia, is now one of the most inhospitable areas in the world, but between 130 and 65 million years ago it was a region brimming with life, with large lakes and rivers. It's here that, since the early twentieth century, the palaeontologists have been finding extremely rich deposits of fossils from the Cretaceous Period, when dinosaurs got to the height of their development before disappearing. In order to understand how important the finds of this area are, let's just say that, of the seven systematic groups in which dinosaurs have been classed, as many as five are present in the fossils of the Gobi desert, and among them most of their carnivore species. It's not just the variety of the species found that makes the Gobi desert unique, but rather the extremely precious fossils showing every stage of the dinosaurs' life, such as still unopened eggs, remains of young dinosaurs just out of their eggs and even, in one case only, a predator and its prey together.