

Adaptation to environment Habitat	Adaptation to environment How do marram grass leaves reduce water loss?
Adaptation to environment How does marram grass survive being buried by sand?	Adaptation to environment Three adaptations of red mangrove (Rhizophora mangle) to swamps
Adaptation to environment Range of tolerance	Adaptation to environment Two abiotic variables affecting plants and two affecting animals
Adaptation to environment How is transect data used to study distribution?	Adaptation to environment Semi-natural habitat

They roll up with stomata on the inner surface, in pits among hairs, trapping humid air; a thick waxy cuticle covers the outer surface.

The place in which a community, species, population or organism lives, described by geographical and physical location and type of ecosystem.

Stilt roots anchor in soft mud; lenticels take in oxygen as mud is anoxic; roots exclude salt. Also vivipary.

Its long vertical rhizomes grow upwards through the sand, and deep roots reach water and anchor it.

Plants: light intensity, soil pH (also water, temperature, minerals). Animals: temperature, dissolved oxygen (also water, salinity).

The span of an abiotic variable within which a species can survive: optimum range, zones of stress either side, zones of intolerance beyond.

A habitat influenced by humans but dominated by wild rather than cultivated species.

Quadrats at intervals along a line record abundance; the abiotic variable is measured at each, then correlated with abundance.

Adaptation to environment

Five abiotic conditions needed for coral reef formation

Adaptation to environment

Why do corals need clear, shallow water?

Adaptation to environment

Why does low pH threaten coral reefs?

Adaptation to environment

Biome

Adaptation to environment

What determines which terrestrial biome develops?

Adaptation to environment

Climate of the taiga and the tundra

Adaptation to environment

Adaptations of the saguaro cactus

Adaptation to environment

Desert adaptations of the dromedary camel

Their zooxanthellae need light for photosynthesis, and light is absorbed with depth and by suspended sediment.

Shallow water (mostly under about 30 m), clear water, warm temperature (best about 23-29 °C), normal seawater salinity, slightly alkaline pH (about 8).

A group of ecosystems with similar communities due to similar abiotic conditions and convergent evolution.

Lower pH reduces carbonate ions available for corals to build calcium carbonate skeletons.

Taiga: long very cold winters, short cool summers, low to moderate snow. Tundra: very cold, permafrost, very low precipitation.

Temperature and rainfall: for any given pattern of the two, one natural ecosystem type is likely to develop.

Body temperature rises by day so less sweating; concentrated urine and dry faeces; fat stored in the hump; thick fur on the back.

Spines instead of leaves, water-storing pleated stem, shallow widespread roots, CAM photosynthesis with stomata open at night.

Adaptation to environment

Rainforest adaptations of plants

Ecological niches

Ecological niche

Ecological niches

Obligate anaerobe

Ecological niches

**Facultative anaerobe vs obligate
aerobe**

Ecological niches

**Which organisms use photosynthesis
as their mode of nutrition?**

Ecological niches

Mixotroph

Ecological niches

Obligate vs facultative mixotroph

Ecological niches

Four stages of holozoic nutrition

The role of a species in an ecosystem, including biotic and abiotic interactions affecting growth, survival and reproduction, and how it obtains food.

Kapok: tall emergent trunk and buttress roots for shallow soil. Many trees: drip-tip leaves shed rain quickly.

Facultative anaerobe: lives with or without oxygen (e.g. yeast). Obligate aerobe: cannot survive without oxygen.

An organism that cannot survive in the presence of oxygen, e.g. Clostridium.

An organism that is both autotrophic and heterotrophic, e.g. Euglena.

Plants, algae and several groups of photosynthetic prokaryotes, such as cyanobacteria.

Ingestion, digestion (internal), absorption, assimilation.

Obligate: needs both modes to grow.
Facultative: can survive using either mode alone.

Ecological niches Saprotroph	Ecological niches Energy sources used by archaea for ATP production
Ecological niches Dentition of Paranthropus robustus and its diet	Ecological niches Dentition of Homo sapiens and its diet
Ecological niches How can the diet of an extinct hominid be deduced?	Ecological niches Two types of mouthparts in leaf-eating insects
Ecological niches How do plants resist herbivory?	Ecological niches Chemical, physical and behavioural adaptations of predators

Light, oxidation of inorganic chemicals, or oxidation of carbon compounds. Archaea are one of the three domains.

A fungus or bacterium that secretes enzymes onto dead organic matter, digests it externally and absorbs the products; a decomposer.

Small incisors and canines, moderate molars, smaller jaw, no sagittal crest: omnivorous.

Very large flat molars and premolars, thick enamel, sagittal crest: herbivorous, grinding tough plant food.

Chewing mandibles (e.g. caterpillars) and piercing stylets (e.g. aphids feeding on phloem sap).

From theories relating dentition to diet in living mammals, applied to skull and tooth features of fossils.

Chemical: venom. Physical: sharp teeth, claws, speed. Behavioural: pack hunting, ambush.

Thorns and other physical structures, and toxic secondary compounds in seeds and leaves.

Ecological niches

Chemical, physical and behavioural adaptations of prey

Ecological niches

Liana

Ecological niches

Epiphyte vs strangler epiphyte

Ecological niches

How are shade-tolerant herbs adapted to the forest floor?

Ecological niches

Fundamental niche vs realized niche

Ecological niches

Competitive exclusion principle

Ecological niches

Two possible outcomes of competition between two species

A woody climbing plant rooted in the soil that uses other trees for support to reach canopy light.

Chemical: toxins, sprays. Physical: camouflage, spines, shells. Behavioural: herding, alarm calls, fleeing.

Large, thin leaves rich in chlorophyll for their mass and a low light compensation point let them photosynthesise in dim light.

Epiphyte grows on branches for light without soil roots. Strangler epiphyte later sends roots to soil that enclose the host.

Two species with the same niche cannot coexist indefinitely; so each ecological niche is unique.

Fundamental: potential niche from adaptations and tolerance limits. Realized: actual niche when in competition with other species.

Elimination of one species, or restriction of both to part of their fundamental niche.