

8.5 Evolution of Australian Biota

Contextual Outline

The very large southern landmass, Gondwana, persisted for some time, giving rise to an array of species that spread across it. When Gondwana broke up, it did so in stages but eventually the Australian continent was isolated from Antarctica and South America.

The available evidence suggests that, as Gondwana was breaking up, a number of global climatic changes were also occurring. These changes in environmental conditions impacted on Australian ecosystems and are reflected in the fossil record. As the biotic and abiotic features of ecosystems were altered, those organisms best adapted to these changes survived and passed on their genetic information to their offspring.

The contribution of paleontology and the study of past environments is important to our understanding of how our present actions may affect our environment and the distribution of flora and fauna in the future.

This module increases students' understanding of the applications and uses of biology, implications for society and the environment and current issues, research and developments in biology.

Assumed Knowledge

Domain: knowledge and understanding

Refer to the *Science Years 7–10 Syllabus* for the following:

- 5.8.3a) discuss evidence that present-day organisms have evolved from organisms in the distant past
- 5.8.1b) identify the role of cell division in growth, repair and reproduction in multicellular organisms
- 5.8.3b) relate natural selection to the theory of evolution
- 5.9.2a) discuss evidence that suggests crustal plates move over time

1. Evidence for the rearrangement of crustal plates and continental drift indicates that Australia was once part of an ancient super continent

Students learn to:

- identify and describe evidence that supports the assertion that Australia was once part of a landmass called Gondwana, including:
 - matching continental margins
 - position of mid-ocean ridges
 - spreading zones between continental plates
 - fossils in common on Gondwanan continents, including *Glossopteris* and *Gangamopteris* flora, and marsupials
 - similarities between present-day organisms on Gondwanan continents
- discuss current research into the evolutionary relationships between extinct species, including megafauna and extant Australian species

Students:

- solve problems to identify the positions of mid-ocean ridges and spreading zones that infer a moving Australian continent
- identify data sources, gather, process and analyse information from secondary sources and use available evidence to illustrate the changing ideas of scientists in the last 200 years about individual species such as the platypus as new information and technologies became available

2. The changes in Australian flora and fauna over millions of years have happened through evolution

Students learn to:

- discuss examples of variation between members of a species
- identify the relationship between variation within a species and the chances of survival of species when environmental change occurs
- identify and describe evidence of changing environments in Australia over millions of years
- identify areas within Australia that experience significant variations in temperature and water availability
- identify changes in the distribution of Australian species, as rainforests contracted and sclerophyll communities and grasslands spread, as indicated by fossil evidence
- discuss current theories that provide a model to account for these changes
- discuss Darwin's observations of Australian flora and fauna and relate these to his theory of evolution

Students:

- gather, process and analyse information from secondary sources to develop a timeline that identifies key events in the formation of Australia as an island continent from its origins as part of Gondwana
- gather information from secondary sources to describe some Australian fossils, where these fossils were found and use available evidence to explain how they contribute to the development of understanding about the evolution of species in Australia
- perform a first-hand investigation, gather information of named Australian fossil samples and use available evidence to identify similarities and differences between current and extinct Australian life forms
- present information from secondary sources to discuss the Huxley–Wilberforce debate on Darwin's theory of evolution
- perform a first-hand investigation to gather information of examples of variation in at least two species of living organism

	<i>Students learn to:</i>	<i>Students:</i>
3. Continuation of species has resulted, in part, from the reproductive adaptations that have evolved in Australian plants and animals	<ul style="list-style-type: none">▪ distinguish between the processes of meiosis and mitosis in terms of the daughter cells produced▪ compare and contrast external and internal fertilisation▪ discuss the relative success of these forms of fertilisation in relation to the colonisation of terrestrial and aquatic environments▪ describe some mechanisms found in Australian flora for:<ul style="list-style-type: none">– pollination– seed dispersal– asexual reproductionwith reference to local examples▪ describe some mechanisms found in Australian fauna to ensure:<ul style="list-style-type: none">– fertilisation– survival of the embryo and of the young after birth▪ explain how the evolution of these reproductive adaptations has increased the chances of continuity of the species in the Australian environment• describe the conditions under which asexual reproduction is advantageous, with reference to specific Australian examples	<ul style="list-style-type: none">▪ analyse information from secondary sources to tabulate the differences that distinguish the processes of mitosis and meiosis▪ identify data sources, gather, process and analyse information from secondary sources and use available evidence to discuss the relative success of internal and external fertilisation in relation to the colonisation of terrestrial and aquatic environments▪ plan, choose equipment or resources and perform a first-hand investigation to gather and present information about flowers of native species of angiosperms to identify features that may be adaptations for wind and insect/bird/mammal pollination
4. A study of palaeontology and past environments increases our understanding of the possible future range of plants and animals	<ul style="list-style-type: none">▪ explain the importance of the study of past environments in predicting the impact of human activity in present environments▪ identify the ways in which palaeontology assists understanding of the factors that may determine distribution of flora and fauna in present and future environments▪ explain the need to maintain biodiversity	<ul style="list-style-type: none">▪ gather, process and analyse information from secondary sources and use available evidence to propose reasons for the evolution, survival and extinction of species, with reference to specific Australian examples▪ process information to discuss a current effort to monitor biodiversity