A biological timeline of Antarctica

The drifting of supercontinents, such as Gondwana, over the surface of the Earth has resulted in major changes in Earth's climate. In turn climate change contributed to other major events, such as the evolution of single celled to multi-celled organisms.

Gondwana in particular had a remarkable 300 million year journey, as it drifted from equator to pole, passing through different climatic zones enroute, enabling it to be colonised by a wide range of new species.

What happened during this journey is recorded in Antarctica's rocks and is summarised below, from the most distant past to the present. (mya = million years ago).

1. Rivers, shallow seas and fishes, 400 mya

- A period of mountain building brought deep rocks to the surface, including granites and metamorphic rocks.
- The mountain building stopped and erosion produced an extensive flat surface, called the 'Kukri Peneplane'
- A 2500 m thick sequence of sedimentary rocks, known as the Beacon Supergroup, was deposited on the peneplane. The oldest of these sedimentary rocks show that East Antarctica had large meandering rivers and was partly covered in lakes and shallow seas. At this time (Devonian), there was rapid evolution of fishes across the world. The rivers of Antarctica were no exception, and fossils of these ancient fish are now found lying throughout the Transantarctic Mountains.

2. A temporary polar landscape, 300 mya

- About 300 million years ago (Carboniferous), the climate changed and Gondwana was partially covered by a large ice sheet.
- As the ice sheet advanced and retreated it left glacial features that are still preserved in the Transantarctic Mountains today.

3. Swamps, coal and conifers

- Slowly the climate warmed, allowing the rapid evolution of varied and thriving swamp communities, complete with small conifer 'trees'.
- The swampy vegetation, including *Glossopteris* trees (see box) eventually became the coal which can now be found along the length of the Transantarctic Mountains.

4. A mass extinction, 250 mya

About 250 million years 96% of all marine species and 70% of land vertebrates on Earth suddenly became extinct. Known as the *Permian extinc*tion it is the most severe of its type in Earth's history and although the reasons for it are not fully understood, the following may be involved:

- a gradual environmental change including a change in sea level, less oxygen in the atmosphere and drier conditions.
- secondly a catastrophic event such as a large meteor impact, increased volcanism, or the sudden release of methane hydrates from the sea floor which killed the already stressed organisms, including the forests of *Glossopteris*.

Myosaurus, a Triassic reptile of Antarctica.
Image: Mojcaj, Wikicommons.

5. Reptiles, amphibians and warming, 200 mya

- The Triassic was initially warm, wet and marked by the sudden evolution of some new plant groups such as conifers and ferns.
- Slowly the Triassic became increasingly hot and dry and the most successful plants were those with drought-resistant adaptations. At this time many new species of vertebrates, such as large, mammal like reptiles, roamed the lush river flats of Antarctica.

6. Dinosaurs, 180 mya

- The Jurassic period is marked by the worldwide rise of dinosaurs, including in East Antarctica. These dinosaurs included large, long necked herbivores, carnivores and flying reptiles.The success of these groups seems to be linked to a better diet for the herbivores amongst them, as the 'seed bearing' ferns were replaced by the more nutritious conifer trees

Glossopteris

The discovery of leafy specimens of *Glossopteris* in East Antarctica as well as in South America, Africa, Madagascar, Australia and India is strong evidence that these land masses were once close and connected. However these land masses are now far apart, which in turn provides evidence that plate tectonics (continental drift) occurs. Such leaves also indicate that Antarctica has not always been cold.

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