Ingula’s fossil finds: Painting a picture of past

Early in 2009 a construction worker found the first strange looking ‘rocks’ at Ingula. They turned out to be the fossilised remains of animals and plants many millions of years older than the dinosaurs. Prominent geologist, Dr Gideon Groenewald, was commissioned to assist with the recording of fossils at the construction site of Eskom’s Ingula Pumped Storage Scheme.

Over ten kilometers of tunnels have been excavated at Ingula. This was done by blasting and removing the rock with big excavation machines. Were it not for the blasting the fossils would never have been discovered. The blasting revealed amazing fossil finds and as excavation exposed layer upon layer of rock, it gave more clues about what the area looked like so many millions of years ago. A sandstone layer was found which contained large tree fossils followed by layers of mudrock containing coalified wood infused with pyrite causing the fossils to shine like gold when freshly exposed. If not treated with a sealant, the mudrock and fossils disintegrate in a matter of days. The freshly exposed rock, with no weathering, made these unique finds very valuable.

During February and early March 2010 excavation reached a layer which, it is believed, contained evidence of Dicynodon lacerticeps – a plant eating mammal-like reptile of the Permian period. It also contained plant fossils, predominantly smaller samples of the Glossopteris family. These have been taken to the Bernard Price Institute for Paleontological Research at WITS University for further examination. Samples have also been sent to the National Museum in Bloemfontein for recording, curating and display.

A significant discovery was made on 17 March 2010 at the inlet works area at Ingula’s upper site. Large bones were preliminary identified as the lower jawbone of a dicynodont.

From the geological evidence Dr Groenewald paints a picture of a cool, dry climate with large wetland systems, such as the Okavango in Botswana today, with enormous trees growing on the larger sandbanks. Fossilised ripple marks indicate that the water level varied from quite shallow (10cm) to five metres deep. The deeper streams were probably faster flowing and heavily laden with silt. Deep mud and clay pools would have been lethal traps for unsuspecting animals.

Dr Groenewald explains that from a conglomerate layer of mud balls, wood, clumps of granite and quartzite he deduced that there were sudden floods from the southeast. These floods caused some of the big Glossopteris trees to fall into the streams, where they were covered by sediment, helping to preserve them, some at the point where they fell. The entire ecosystem where the animals and plants lived was buried about 255 million years ago.
Recognising the significance of the fossil finds, Dr Jennifer Botha-Brink of the Bloemfontein National Museum has expressed her appreciation for the contribution and commitment by Eskom in enabling the recovery and monitoring of the fossil finds during the construction of the Ingula Pumped Storage Scheme. From the samples already delivered to them they estimate that at least two gorgonopsians (predators of that time) and 24 fossils of plant eating animals (at least two *Dinanomodon*, one *Oudenodon*, and numerous *Daptocephalus* and *Dicynodon*) have been discovered.

The likelihood that one or two new species of animals might be present has not been ruled out and the museum expects to be able to give a final report on the fossil finds by the end of 2013. They have also appointed new staff to prepare the large quantity of material from Ingula.
In South Africa, all fossils are regarded as National Heritage Objects which belong to the State. The museum, as curator, will make some of the items available for display and educational purposes in the Ingula Visitors Centre.

The Permian Period

The Permian period, which ended in the largest mass extinction the Earth has ever known, began about 299 million years ago. The emerging supercontinent of Pangaea presented severe extremes of climate and environment due to its vast size. The south was cold and arid, with much of the region frozen under ice caps. Northern areas suffered increasingly from intense heat and great seasonal fluctuations between wet and dry conditions. The lush swamp forests of the Carboniferous were gradually replaced by conifers, seed ferns, and other drought-resistant plants.

Early reptiles were well placed to capitalize on the new environment. Shielded by their thicker, moisture-retaining skins, they moved in where amphibians had previously held sway. Over time, they became ideally suited to the desert-type habitats in which they thrive today.

Later, other mammal-like reptiles known as therapsids found an internal solution to keeping warm—scientists suspect they eventually became warm-blooded, conserving heat generated through the breakdown of food.

The therapsids flourished during the Permian, rapidly evolving many different forms, ranging from dinosaur-like fanged flesh-eaters to plodding herbivores. Some species reached a huge size, weighing in at over a ton. During the later Permian, smaller varieties emerged and from them the first mammals eventually evolved.

Massive Loss of Life

The Permian period came to a calamitous close 252 million years ago, marking a biological dividing line that few animals crossed. The Permian extinction—the worst extinction event in the planet's history—is estimated to have wiped out more than 90 percent of all marine species and 70 percent of land animals.

Various theories seek to explain this mass extinction. Some scientists think a series of volcanic eruptions pumped so much debris into the atmosphere that the sun was blocked out, causing a significant drop in temperature and preventing plant photosynthesis, which in turn caused food chains to collapse.

Other scientists point to global climate change, citing evidence for a period of sudden warming and cooling. These rapid extremes of conditions may have meant species were unable to adjust. Other theories include a catastrophic release of methane gas stored under the seabed, triggered by earthquakes or global warming, or a massive asteroid impact.
An artist’s impression of life at the end of the Permian period. Dicynodont in the background, lystrosaurus in foreground and gorgonopsian on the right.

Perhaps a combination of factors was to blame. But whatever the cause, new animals and plants would evolve to fill the void. Not least among them: the dinosaurs.

(Source http://science.nationalgeographic.com/science/prehistoric-world/permian.html)