Reptile 'cousins' shed new light on end-Permian extinction

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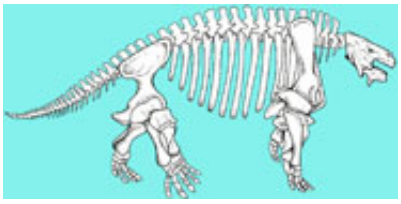

The pareiasaur parareptile Scutosaurus. Image by Professor Mike Benton

(PhysOrg.com) -- An international team of researchers studied the parareptiles, a diverse group of bizarre-looking terrestrial vertebrates which varied in shape and size. Some were small, slender, agile and lizard-like creatures, while others attained the size of rhinos; many had knobbly ornaments, fringes, and bony spikes on their skulls.

The researchers found that, surprisingly, parareptiles were not hit much harder by the end-Permian extinction than at any other point in their 90 million-year history.

Furthermore, the group as a whole declined and diversified time and time again throughout its history, and it was not until about 50 million years after the end-Permian crisis that the parareptiles finally disappeared.

During the end-Permian extinction, some 250 million years ago, entire

groups of animals and plants either vanished altogether or decreased significantly in numbers, and the recovery of the survivors was at times slow and prolonged before new radiations took place.

By studying the fossil record, palaeontologists can examine how individual groups of organisms responded to the end-Permian event and assess just how dramatic it was. However, as the quality and completeness of the fossil record varies considerably, both geographically and stratigraphically, palaeontologists need to find a way to 'join the dots' and piece together the fragments of a complex mosaic to give a more satisfactory and better picture of ancient life's diversity.

The team led by Dr Marcello Ruta of Bristol's School of Earth Sciences, and including scientists from Germany, Brazil and North America, used the evolutionary relationships among known parareptiles to produce a corrected estimate of changing diversity through time.

Dr Marcello Ruta said: "Evolutionary relationships can be superimposed on a time scale, allowing you to infer missing portions of past diversity. They are powerful tools that complement and refine the known record of extinct diversity. If you visualize evolutionary relationships in the form of branching diagrams and then plot them on a time scale, new patterns begin to emerge, with gaps in the fossil record suddenly filling rapidly."

One of the team members, Juan Cisneros of the Universidade Federal do Piauí, Ininga, Brazil said: "It is as if ghosts from the past appear all of a sudden and join their relatives in a big family tree – you have a bigger tree. This way, you can start analysing observed and extrapolated abundance of species through time, and you can quantify novel origination and extinction events that would otherwise go unnoticed if you were to look at known finds only."

Co-author Johannes Müller of the Museum für Naturkunde, Berlin

added: "Researchers who investigate changing diversity through time have a huge battery of basic and advanced analytical and statistical methods at their disposal to study patterns of diversification and extinction. Classic text-book views of waxing and waning of groups through deep time will certainly benefit, where possible, from the use of evolutionary thinking."

University of Washington's Linda Tsuji, also part of the research team, concluded: "This is the first time that the history of parareptiles has been examined in such detail. But this is only the beginning. These bizarre-looking vertebrates continue to inspire generations of researchers, not only those interested in mass extinctions. They are abundant, diverse, and we still know very little about their biology. We hope that this study will initiate a more in-depth study of the response of terrestrial vertebrates to global catastrophes."

The new findings are published online today in the journal *Palaeontology*.

More information: Ruta, M., Cisneros, J.C., Liebrecht, T., Tsuji, L.A. and Müller, J. 'Amniotes through major biological crises: faunal turnover among parareptiles and the end-Permian mass extinction' in Palaeontology

Provided by University of Bristol