

# Geologic Findings Undermine Theories of Permian Mass Extinction Timing

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The Karoo Basin in South Africa holds the world's best record of the Permian Mass Extinction. Credit: Robert Gastaldo, Colby College

(PhysOrg.com) -- New scientific findings by geologist Robert Gastaldo of Colby College in Waterville, Maine, and colleagues call into question popular theories about the largest mass extinction in Earth's history.

A paper reporting the results by Gastaldo, South African scientist Johann Neveling, and two 2008 Colby undergraduate students, C. Kittinger "Kit" Clark and Sophie Newbury, appears in the March 2009 issue of *Geology*.

Tens of millions of years before dinosaurs roamed Earth, their ancestors were all but eliminated in a catastrophic event called the Permian Mass Extinction. The Permian period extended from 299 to 252.6 million

years ago.

"The Permian-Triassic boundary marks the greatest extinction event in Earth's history, with significant loss of biodiversity both on land and in the oceans," says H. Richard Lane, a paleontologist and program director in the National Science Foundation (NSF)'s Division of Earth Sciences, which funded the research.

"Until this study, it was believed that the event was marked by unique rocks traceable across southern hemisphere continents. This research calls into question whether the extinction event is actually constrained in the geologic record on land."

Ideas about the event's impact on land animals and plants are based largely on records in the Karoo Basin in central South Africa, where the best fossil records from that time are found, and where Gastaldo and his students have worked since 2003 with funding from NSF.

Earlier analysis of the rock record by other scientists working in South Africa led them to hypothesize about the nature, scope and timing of the mass die-off of prehistoric amphibians and reptiles.

They claimed that one unique sedimentary layer in the Karoo Basin overlies fossils of the last reptiles of the Permian period (synapsids, including the genus *Dicynodon*).

This layer has been dubbed "the dead zone" because of its absence of fossil remains.

This dead zone was thought to be synchronous in time and space, marking the event across southern Africa and as far away as Antarctica.

Now Gastaldo and co-authors report that they have found conflicting

stratigraphic evidence in the Karoo Basin.

They discovered that this dead zone layer, or event bed, is not found at the same physical position in the rock record at all places, even across the immediate landscape where it was first described.

As such, it is not a reliable marker of the mass extinction of terrestrial animals, Gastaldo says.

Within one kilometer, just across the valley from the site where it was first described, the layer occurs lower in the rock record by eight meters (more than 25 feet).

Several hundred kilometers away, at Lootsberg Pass, reptile fossils occur above the layer rather than below it, further undermining the credibility of the zone as a marker of the mass extinction of animals at the end of the Permian.

Gastaldo says that the research proves that "there is no evidence to support a terminal extinction event in the record of the Karoo Basin, based on the criterion of an unique event bed or dead zone."

Provided by NSF

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