Canada's shores saved animals from devastating climate change 252 million years ago

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The shorelines of ancient Alberta, British Columbia and the Canadian Arctic were an important refuge for some of the world's earliest animals, most of which were wiped out by a mysterious global extinction event some 252 million years ago.

U of C scientists have solved part of the mystery of where marine organisms that recovered from the biggest extinction on earth were housed. A team of researchers, including Charles Henderson, a geoscience professor at the U of C, Tyler Beatty, a PhD candidate at the U of C and J-P Zonneveld, an associate professor at the U of A, discovered that the shorelines of ancient Canada provided a refuge for marine organisms that escaped annihilation during the Permian-Triassic extinction event.

"The boundary between the end of the Permian and beginning of the Triassic period saw unparalleled species loss in the marine realm, and biotic recovery was delayed relative to other mass extinctions," says Henderson, in a paper published in the October edition of *Geology*. "A major unresolved question has been discovering where the marine organisms that recovered from the extinction were housed."

Henderson adds that this may not be the only refuge where life survived after the mass extinction, but it is the only area discovered to date.

During the Permian, all the world's land masses joined together into a single supercontinent called Pangea. Near the end of the Permian, during the mass extinction, about 95 per cent of all marine species and 70 per cent of land species died and the recovery of life on Earth took longer than other extinction events because so much biodiversity was lost. There are several theories as to why this mass extinction event took place ranging from the heating of the Earth to a catastrophic event. The authors favour major climate change since increased temperatures and elevated CO2 levels are linked to oxygen stress that is key to the results of their research.

On land, the Permian period marked the expansion of reptiles and mammal-like reptiles. Perhaps the most famous is Dimetrodon, a pre-dinosaur reptile, which grew to about 11 feet (3.5 metres) and had what looked like a sail on its back.

Researchers have been studying the Permian-Triassic extinction event for years, but mostly in Greenland and south China where formations represent areas of deep water and have very low levels of oxygen. The inter-university research team studied trace fossils along the ancient shorelines found in rock located in western Alberta, northeast British Columbia, and the barren landscapes of the Canadian Arctic. Trace fossils preserve the activity of organisms and can be burrows or other actions created by the ancestors of modern worms and marine arthropods. The dating of these shorelines is confirmed by the presence of distinct conodonts – a microfossil in which the passing of time is recorded by rapid evolutionary changes.

"These trace fossils present a record of ocean-bottom dwelling organisms and indicate locally well-oxygenated conditions in an ocean otherwise characterized by widespread anoxia," says Beatty - the lead author. "Within this habitable zone, the latest Permian extinction levels are reduced and the recovery time is minimized. The findings support

the idea that reduced oxygen levels is a major cause of why the recovery from Earth's greatest extinction was delayed."

The paper "Anomalously diverse Early Triassic ichnofossil assemblages in northwest Pangea: A case for a shallow-marine habitable zone" by Tyler W. Beatty, J-P Zonneveld and Charles Henderson, is available online at: www.gsajournals.org/perlserv/? … &issn=0091-7613&ct=1

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