

Latitudinal diversity gradients in deep time: a case study using dinosaurs of the Upper Jurassic Western Interior, USA

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The latitudinal biodiversity gradient, the difference in number of species from the equator to the poles, is the most pervasive pattern of biodiversity distribution on today's Earth. Despite over 50 years of research on the subject, the causative mechanisms of the pattern remain unknown, and to date, around 30 different hypotheses have been proposed. One way of testing various hypotheses relating to the cause of the latitudinal biodiversity gradient is to examine it at a time in Earth's history when conditions were different. During the Mesozoic, the Earth was in a 'greenhouse' state: there were no ice caps at the poles, and thus latitudinal temperature gradients were significantly reduced. Previous examinations of the latitudinal biodiversity gradient during the Mesozoic have failed to find evidence for the pattern among terrestrial biotas, but have suffered from both temporal and spatial averaging, potentially obscuring true diversity patterns. I examined biodiversity distribution with latitude in dinosaur faunas in the Upper Jurassic Morrison Formation, Western Interior, USA. The Morrison Formation crops out over 1.2 million square kilometres, 12 degrees of latitude, and is home to some of the most iconic and well-known dinosaurs, such as *Stegosaurus* and *Diplodocus*. I divided the Morrison Formation into chronostratigraphic packages of around 1 million years in duration, and examined how diversity varied with latitude and through time in the formation. There is no evidence for a latitudinal biodiversity gradient at this time in this geographic location, but there is some evidence for niche partitioning among species. The results suggest that the modern latitudinal biodiversity gradient may be the artefact of the unique set of climatic conditions present during the late Cenozoic when Earth entered an 'icehouse' state.