



Summary of the Distribution of Dinosaur Species Across Western Canada and Northwestern United States of America

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Sydney D. Roper

Introduction

Many different species of dinosaurs have been discovered in western Canada and the Northwestern United States in a little over the last century. This includes the ceratopsians *Styracosaurus albertensis*, *Centrosaurus apertus*, the tyrannosaurids *Albertosaurus sarcophagus*, *Gorgosaurus libratus*, and *Tyrannosaurus rex*, as well as *Ankylosaurus magniventris*, and many others. By reviewing papers published on the discovery of these dinosaur's fossils and plotting the coordinates that these fossils were found at, it shows the distribution of these species over certain geographical areas. By observing the distributions of these species it is possible to see where more fossils of a particular species may be discovered in the future, and which animals may have had the opportunity to interact with each other.

Methods and Materials

Information on the specimens was collected by reviewing literature describing fossils that have been found, and cataloguing the specimen's type, catalogue number, the formation the fossil was found in, and the GPS coordinates it was found at. These articles were found and compiled from the University of Alberta Database, the Web of Science Core Collection, the Web of Science Zoological Records, Scopus, and Georef databases. The coordinate information was obtained either straight out of the text, or using the physical directions described in the text to find the coordinates on a map. The coordinate information that was gathered, was then plotted on Google Earth pro to compare the distribution of different species with each other.

Discussion and Analysis

Styracosaurus albertensis

To accumulate information on the discoveries of *Styracosaurus albertensis* fossils multiple articles were reviewed, including "A New Genus and Species of Ceratopsian from the Belly River Formation", by Lawrence M. Lambe, "Morphological Variation and Asymmetrical Development in the *Styracosaurus albertensis*", by Robert B. Holmes, etc. After compiling information on the location and formation of these fossils, it was found that *S. albertensis* fossils had been found most concentrated around Dinosaur Provincial Park, Alberta. Although there have also been

specimens found as far South as highway 879 near Milk river, Alberta, and as far North as Musidora, Alberta. As some specimens have been found spanning such a large relative distance from each other it could be inferred that more *S. albertensis* fossils may be found anywhere between these two locations, granting that the prehistoric environment was a suitable area for dinosaur bones to be preserved. It was also found that *S. albertensis* was mainly found in the Dinosaur Park Formation, as well as some specimens from the Belly River Formation.

Centrosaurus apertus

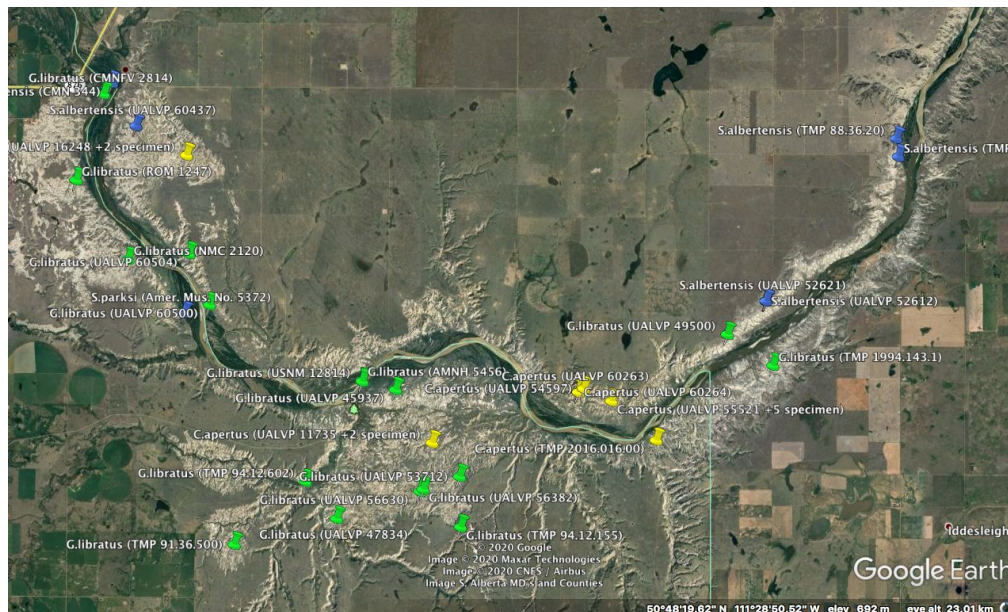
To compile information on the discoveries of *Centrosaurus apertus* fossils various papers were reviewed. These included, "Taphonomy of a Monodominant Centrosaur Apertus (Dinosauria: Ceratopsia) Bonebed from the Oldman Formation of Southeastern Alberta", by Kentaro Chiba, Michael J. Ryan, et al., "Cretaceous Dinosaur Bone Contains Recent Organic Material and Provides an Environment Conducive to Microbial Communities", by Evan T. Saitta, Renxing Liang, et al. Once the information on the location and formation of the specimens was compiled from the papers, it displayed that the reviewed specimens were concentrated in the Dinosaur Provincial Park, Alberta area. This large concentration makes finding more *Centrosaurus apertus* fossils in the same area very probable. The papers also showed that the specimens were found in the Dinosaur Park formation.

Gorgosaurus libratus

Various articles were reviewed in order to compile information on the discoveries of *Gorgosaurus libratus* in western Canada. These articles included, "On a New Genus and Species of Carnivorous Dinosaur from the Belly River Formation of Alberta with a Description of the Skull of *Stephanosaurus Marginatus* from the Same Horizon", by Lawrence M. Lambe, "Reassessment of a Juvenile *Daspletosaurus* from the Late Cretaceous of Alberta, Canada with Implications for the Identification of Immature *Tyrannosaurids*." by Jared T. Voris, et al. Once information was compiled on the location and formation of the fossils, it was found that *G. libratus* fossils were also most greatly concentrated in the Dinosaur Provincial Park, Alberta area, although there was another specimen found as far east as the South Saskatchewan river near the Alberta Saskatchewan border. It could be inferred that more *G. libratus* fossils may be found in the area between Dinosaur Provincial Park and the Alberta Saskatchewan border in the future, once again if the prehistoric environment was suitable to preserve fossils. The reviewed fossils of *G. libratus* were also generally found in the Dinosaur Park formation or the Belly River formation, as well as one of the specimens being found in the Horseshoe Canyon formation.

Dinosaur Provincial Park contains fossils of *Styracosaurus albertensis*, *Centrosaurus apertus*, and *Gorgosaurus libratus*. These species were also all found in the Dinosaur Park Formation, and

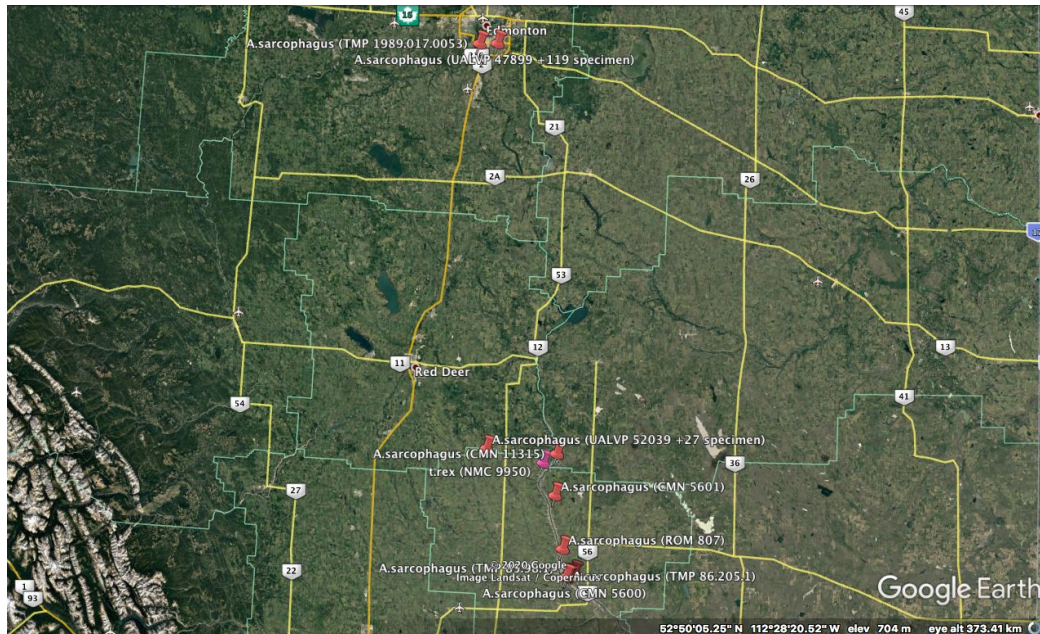
Gorgosaurus libratus and *Styracosaurus albertensis* specimens were also found in the Belly River formation. As the species were found in the same formations it is likely that their species lived around the same time as each other. As *S. albertensis* and *C. apertus* were living with the known carnivorous *G. libratus*, it could be inferred that they may have experienced a prey-predator relationship with *G. libratus*. Whereas *S. albertensis* and *C. apertus* may have been in competition for resources, depending on their ecological niches.



(blue pins represent *Styracosaurus albertensis*, yellow pins represent *Centrosaurus apertus*, green pins represent *Gorgosaurus libratus*, All in the Dinosaur Provincial Park, Alberta area)

Albertosaurus sarcophagus

To gather information on the discoveries of *Albertosaurus sarcophagus* fossils found in western Canada numerous papers were reviewed, including, “Cranial Anatomy of Tyrannosaurid Dinosaurs from the Late Cretaceous of Alberta, Canada” by Phillip J. Currie, “A Taxonomic Assessment of the Type Series of *Albertosaurus sarcophagus* and the Identity of Tyrannosauridae (Dinosauria: Coelurosauria) in the *Albertosaurus* Bonebed from the Horseshoe Canyon Formation (Campanian- Maastrichtian, Late Cretaceous)” by Thomas D. Carr, etc. After the information from these papers had been compiled on the location and formation of these fossils, it was found that *Albertosaurus sarcophagus* has been found in the Drumheller, area of Alberta, the Dry Island Buffalo Jump Provincial Park, Alberta area, and as far north as south Edmonton, Alberta. It could be inferred that the area between Dry Island Buffalo Jump and Edmonton may possibly yield more fossil discoveries in the future. The specimens that were covered also displayed that they were found in the Horseshoe Canyon formation. *Gorgosaurus libratus* has also been found in the Horseshoe Canyon Formation, as these tyrannosaurids appear to have lived during the same time period, it is possible that they may have interacted during their lifetime.



(red pins represent *Albertosaurus sarcophagus* in the Drumheller, Dry Island Buffalo Jump, and Edmonton, Alberta area)

Tyrannosaurus rex

Multiple articles were reviewed to gather information on discoveries of *Tyrannosaurus rex* fossils. These include, “The Paleoenvironment of *Tyrannosaurus rex* from Southwestern Saskatchewan, Canada”, by Elisabeth E. McIver, “New Examples of *Tyrannosaurus rex* from the Lance Formation of Wyoming, United States” by Sebastian G. Dalman, etc. These articles were used to compile information on the location and formation of *Tyrannosaurus rex* fossils. The data gathered shows that *T. rex* was greatly dispersed across northwestern United States and western Canada, appearing in Alberta, Saskatchewan, Montana, Wyoming, and Utah. It is possible to speculate that *T. rex* could be found again in northern Utah, throughout Wyoming, eastern Montana, southern Saskatchewan, and southeastern Alberta. *T. rex* was also found in multiple formations, most abundantly in Hell Creek formation, as well as in Lance formation, North Horn formation, Nelson formation, and Frenchman formation.

Ankylosaurus magniventris

To compile information on discoveries of *Ankylosaurus magniventris* fossil’s articles were reviewed. These included, “Redescription of *Ankylosaurus magniventris* Brown 1908 (*Ankylosauridae*) from the Upper Cretaceous of the Western Interior of North America”, and “Baby Dinosaurs from the Late Cretaceous Lance and Hell Creek Formations and a Description of a New Species of Theropod” both by Kenneth Carpenter. These papers were used to gather information of the location and formation that *Ankylosaurus magniventris* specimens were found at. The information gathered shows that the specimens were both found in eastern Montana,

and *Centrosaurus apertus* likely cohabitated as they were also found in the same formation and in concentrated amounts around Dinosaur Provincial Park, Alberta. The data displayed by the distribution of specimens of a species can also show areas where it would be likely to make new fossil discoveries in the future. *Styracosaurus albertensis* specimens are likely to be found between Milk River, in southern Alberta, and Misidora, in northern Alberta. Whereas, *Centrosaurus apertus* specimens are likely to be found in the area around Dinosaur Provincial Park, and new specimens of *Gorgosaurus libratus* may possibly be found between Dinosaur Provincial Park and the Alberta Saskatchewan border. It is conceivable that a new *Albertosaurus sarcophagus* specimen could potentially be found between Dumheller and Edmonton, Alberta. It is also possible that a new specimen of *Tyrannosaurus rex* could be found over a wide range of western North America, including northern Utah, throughout Wyoming, eastern Montana, southern Saskatchewan, and southeastern Alberta. It is also probable that new specimens of *Ankylosaurus magniventris* could be found between Lake Fort Peck, Montana and the Southeastern border of Montana.

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