

Multituberculate Mammals of the Uppermost Cretaceous Lance Formation, Southwestern Wyoming

Shelly L. Donohue, Senior: ESS and Biology
Mentor: Gregory P. Wilson (Biology)

Introduction:

The Cretaceous-Paleogene (K-Pg) mass extinction event was one of the most critical points in the evolutionary history of mammals. In North America, it is represented by fossil localities spanning the Lancian (~69-65.5 Ma) and Puercan (~65.5-64.5 Ma) land mammal 'ages,' which occur largely in deposits representing coastal lowland paleoenvironments, adjacent to the large Western Interior Seaway. The early Puercan faunas contain a small number of local survivors of the K-Pg extinction event, as well as a substantial influx of immigrants that seed the ensuing recovery and radiation of mammals. Here, I present a preliminary systematic paleontological study of more than 200 mammalian fossils from a Lancian-aged local fauna from the Lance Formation of southwestern Wyoming, on the eastern flank of the Rock Springs Uplift. Because this local fauna was farther west, it was upland and paleoenvironmentally distinct from most other known Lancian local faunas, allowing further insight into the K-Pg transition.

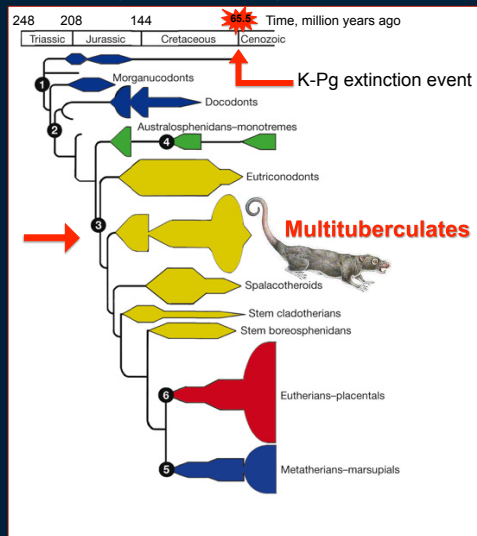


Figure 1: Mammalian phylogeny and abundance through time. Modified from Lou 2007. Multituberculates were small rodent-like mammals that spanned over 100 million years in the fossil record until their extinction in the Late Eocene.

Methods:

• Field area: The Black Butte Station local fauna was sampled from the Lance Formation on the eastern flank of the Rock Springs Uplift in Sweetwater County, WY (Fig. 2)

• Lance Formation: Vertebrate fossil bearing localities occur in a fine- to medium-grained poorly sorted sandstone representing channel, levee, and overbank deposits (Breithaupt 1982)

• Two independent collections were made in the 1970's:

• University of California Museum of Paleontology (UCMP) locality:
• V-84215, Lawson Micro

• University of Wyoming Geology Museum (UW) localities:
• V-79032, Robber's Roost
• V-79033, Dinoray

• Collection techniques: detailed surface crawling and screenwashing, followed by identification and cataloguing into both UW and UCMP fossil databases.

• Further identification and photographing at University of Wash. by Shelly Donohue and Greg Wilson.

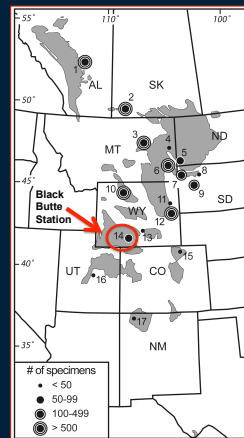
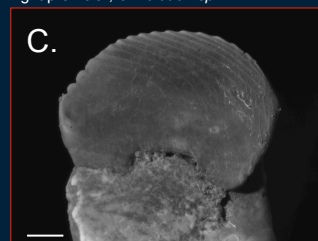
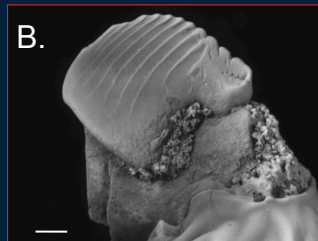
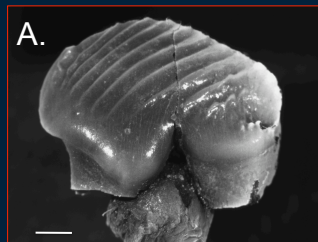


Figure 2: (above)

Map of Lancian fossil localities in the North American Interior. Size of dot correlates to number of published specimens. Modified from Wilson 2010

Figure 3: (left and below)

Scale bars are 1 mm
A.) UCMP 197657, lower left fourth premolar, *Meniscoessus* sp. B.) UW 15582, lower left fourth premolar, *Cimolodon* sp. C.) UW 15583, lower right premolar, *Cimolodon* sp.



Results and Discussion:

• Preliminary study has concentrated on the multituberculates from the Black Butte Station faunal assemblage:

• One new species within the *Meniscoessus* genus (Fig 3a)
• Two new species within the *Cimolodon* genus (Fig 3b, c)

• These results suggest this fauna is distinct from faunas of similar age, likely due to differences in paleoenvironments as well as paleogeographic distance

• Most Lancian fossil localities occur in the Great Plains region, representative of coastal lowland deposits adjacent to the Western Interior Seaway

• The Black Butte Station locality occurs on the eastern flank of the Rock Springs uplift, which was upland and could be characterized as a wide arch in the Late Cretaceous (Mederos et. al 2005)

• Black Butte Station is located farther southwest than most Lancian fossil localities

Conclusions and Future Research:

Changes in mammalian faunal dynamics across the K-Pg extinction event has been well documented in North America (Wilson 2005), however; there is a bias towards collections of specimens from coastal lowland paleoenvironments. The Black Butte Station local fauna represents a distinct paleoenvironment, further southwest from most Lancian localities thus, it offers new insight into mammalian evolution leading up to the K-Pg extinction event, and shows the importance of sampling from undersampled regions and paleoenvironments. Upland refugia has been proposed as one possible source of Puercan immigrants, and studies on faunas such as the Black Butte Station local fauna will be useful in testing this hypothesis. Future research on this project will include analysis of Metatherian and Eutherian mammals from this assemblage.

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