Reopening the Mother’s Day Quarry (Jurassic Morrison Formation, Montana) is Yielding New Information

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ABSTRACT

The Mother’s Day Quarry (MDQ) is a dinosaur-bearing bone bed in the Late Jurassic (Kimmeridgian) Morrison Formation located in Carbon County, Montana. First discovered in 1994, the quarry has yielded over 2,500 elements after having been excavated for two seasons by miners from the Museum of the Rockies, and subsequently from 2000 to 2012 by teams from the Cincinnati Museum Center. Aside from approximately 1,200 toothed teeth and numerous skin impressions, all of the vertebrate remains are exclusively from the sauropod Diplodocus. The bone-bed unit has been interpreted to be the result of a debris flow following a drought-induced mass-mortality event. The size of these Diplodocus elements is consistent with ages ranging from 38% to 75% in length of the same elements in the smallest adult Diplodocus specimen at the Carnegie Museum (CM-S94). Initially, the constantly small sizes were interpreted as representing an age-segregated herd of juvenile to subadult individuals. More recently, however, histological evidence suggests that there were both subadult and adult animals comprising a herd of ontogenetically young individuals, caused by a decrease in growth rates.

The Bighorn Basin Paleontological Institute (BBPI) has resumed excavations at the MDQ each summer since 2017. Four toothed teeth and two skin impressions have been collected, as well as approximately 125 (updated) isolated or partially articulated Diplodocus elements, the smallest sizes of which are consistent with the previously reported rema.ned. Additionally, numerous pathologies have been observed on these elements, including a well excavated sulcus on the proximomedial surface of an ulna (Fig. 1). Further analysis of the pathological features and their prevalence among all Mother’s Day material is likely to provide important additional information on the life histories of this common North American-Late Jurassic taxon. Just as importantly, it may provide new insights into the ongoing “subadult v. dwarf population” discussion.

THE MOTHERS DAY QUARRY 1994-2012

Excavated by the Museum of the Rockies in 1994 and 1995, and by the Cincinnati Museum of Natural History & Science for 11 seasons between 1996 and 2012, the MDQ preserves a drought-induced mass-mortality event in which a mono-dominant, age-segregated herd of Diplodocus was transported and preserved in a high density debris flow following a drought-induced mass-mortality event. Pathological evidence includes several rib fractures showing differing levels of reactionary bone growth and bifurcation.

THE MOTHERS DAY QUARRY 2017-2019

The BBPI resumed excavations at the Mother’s Day Quarry each field season since 2017. In that time, we have excavated approximately:

- 125 additional elements, including:
  - 4 thoropod teeth
  - 4 skin impressions
  - numerous partially articulated elements

All of the elements continue to be relatively small relative to adult Diplodocus sp.

PATHOLOGIES

Numerous pathologies have been identified on the newly collected specimens. These include:

- A well excavated sulcus on the proximomedial surface of an ulna (Fig. 1)
- Several rib fractures showing differing degrees of reactionary bone growth and bifurcation (Fig. 2)

Further analysis of the pathological features and their prevalence among all Mother’s Day material is likely to provide important additional information on the life histories of this common North American-Late Jurassic taxon. Just as importantly, it may provide new insights into the ongoing “subadult v. dwarf population” discussion.

REFERENCES


Taphonomic evidence suggests a single mass-mortality event following a drought-induced mass-mortality event. The size of these Diplodocus elements is consistent with ages ranging from 38% to 75% in length of the same elements in the smallest adult Diplodocus specimen at the Carnegie Museum (CM-S94). Initially, the constantly small sizes were interpreted as representing an age-segregated herd of juvenile to subadult individuals. More recently, however, histological evidence suggests that there were both subadult and adult animals comprising a herd of ontogenetically young individuals, caused by a decrease in growth rates.

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- numerous elements are loosely fused, suggesting ontogenetically young individuals.

THANK YOU!

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Support paleontology and earth science research, education, and outreach.

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