

**Canyonlands Natural History Association**

**Discovery Pool Grant**

**Final Report**

**Project Title:** A new, diverse dinosaur and plant community in the Salt Wash member of the Upper Jurassic Morrison Formation

**Federal Partner:** Bureau of Land Management, Henry Mountains Field Station, Hanksville, UT

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## **Statement of research need and questions addressed**

The Upper Jurassic Morrison Formation is exposed from New Mexico and Arizona to southern Canada, and it records the last 7-8 million years of the Jurassic Period in North America. Most of the well-known and diverse dinosaur quarries in the Morrison Formation are from the Brushy Basin Member (e.g., Como Bluff, Dinosaur National Monument, Cleveland-Lloyd, Hanksville-Burpee, Dry Mesa). The Salt Wash Member is stratigraphically older and has the potential to provide a window into both the biogeography and biostratigraphy of the Morrison dinosaur fauna. However, the Salt Wash has produced many fewer fossil localities than the Brushy Basin, and as a result, the biota of the Salt Wash Member is less well documented than that of the Brushy Basin.

The Tal Site is a vertebrate fossil locality located on BLM land near Hanksville, Utah, in the Salt Wash Member of the Morrison Formation (Upper Jurassic). Preliminary exploration of the site has revealed dozens of exposed fossil specimens scattered over an area of approximately 2 km<sup>2</sup>. With a diverse dinosaur fauna and preserved plants, the Tal Site promises to provide a valuable window into the poorly-understood time when the lower part of the Morrison Formation was being laid down. Currently, the fossils at the Tal Site are protected only by their remoteness. The site is at risk of being looted or vandalized, unless it is further documented and protected.

Our three goals in the project were:

1. systematically survey paleontological and paleobotanical fossil specimens at Tal Site, including photographic documentation and GPS logging;
2. assess the potential of each specimen to be removed and prepared (to be reserved for the handful of articulated specimens), or left in place;
3. gather photographic and video documentation of the fossils at the site for future education and outreach activities.

## **Methodology and personnel**

To accomplish our goals, we spent one week in July 2018 surveying the vicinity of the Tal Site for vertebrate and plant fossils. One of our collaborators, John Foster, was only able to join us for one day, but we were assisted for the whole week by Jessie Atterholt, an anatomist and paleontologist. The field team comprised Mathew Wedel, Brian Engh, and Jessie Atterholt for the full week, and John Foster for one day.

We re-located all of the fossils that had been found in situ at the Tal Site to that point, and surveyed new areas to the south of the original Tal Site. We photographed and recorded the GPS coordinates of every fossil in the study area, including those that had been discovered in previous years.

## **List number and names of staff utilized throughout the project**

### Principal Investigator (1):

Mathew Wedel, PhD, anatomist and paleontologist, Western University of Health Sciences, Pomona, California.

### Collaborators (3):

John Foster, PhD, paleontologist, Utah Field House of Natural History State Park Museum, Vernal, Utah. (formerly of Museum of Moab)

Brian Engh, paleoartist

Jessie Atterholt, PhD, anatomist and paleontologist, Western University of Health Sciences, Pomona, California.

## **Findings**

In the 2018 field season we spent a week surveying the outcrops of the Salt Wash Member of the Morrison Formation in the vicinity of the Tal Site. Prior to 2018, a total of 25 fossils had been located over an area approximately 2 km<sup>2</sup>. In July of 2018 we relocated and logged all of the previously-discovered fossils, and surveyed an additional 2 km<sup>2</sup>, over which area we discovered an additional 37 fossils. In total we documented 62 fossils, including 1 coprolite (fossilized droppings), 7 petrified logs, and 54 dinosaur fossils, ranging from single isolated bones to partial skeletons.

We have continued to work at the Tal Site in every subsequent year, except 2020 when we were sidelined by the pandemic. This further work has been financed by our institutions (for Mathew Wedel, John Foster, and Jessie Atterholt) and by Patreon supporters (for Brian Engh). We continued to expand the surveyed area, building on our work in July of 2018. In May of 2019 we discovered a complete right humerus and incomplete left humerus of the giant dinosaur *Brachiosaurus* – this was the first time that portions of both humeri had been collected from a single individual animal. The *Brachiosaurus* fossils were on Utah state land adjoining the BLM land that we had previously explored. Using John Foster's collecting permits and under the auspices of the Utah Field House of Natural History State Park Museum, we collected the incomplete left humerus in June of 2019, and the complete right humerus in October, 2019. In 2021 we discovered and collected a nearly-complete rib of *Brachiosaurus*, more than 2.2 meters long, from the same area as the humeri. All of the *Brachiosaurus* bones are in the collections of the Utah Field House.

One of our goals in 2018 was to determine if any of the fossils at the Tal Site could be safely removed, to be conserved in a museum. All of the fossils that we have found on BLM land are embedded in hard sandstone, and removing them would require power tools and a way to transport both the tools and the fossils over very rough ground. The *Brachiosaurus* bones on the adjoining state land were in softer mudstone, so they were fairly straightforward to remove from the ground, although we needed Clydesdale horses to pull the plaster jacket with the complete humerus to the nearest road, where we could load it on a trailer. On the plus side, revisiting the site for almost a decade (2014-2023) has given us the opportunity to determine the rate of erosion. The fossils embedded in sandstone have not eroded appreciably in that period, so we anticipate that they will be safe for potentially several more decades, provided that they are not deliberately vandalized.

In summary, the 2018 Discovery Pool grant was the seed that kicked off more than 5 years of productive fieldwork in and around the Tal Site.

### **Application of research results to future educational or interpretive efforts**

We have disseminated our findings in public lectures (Wedel 2018, 2021, 2022), conference presentations (Wedel et al. 2020, Foster et al. 2021), one peer-reviewed scientific paper (Curtice et al. 2023), and one educational YouTube video to date (Engh and Wedel 2020), with more presentations, papers, and videos planned. In particular, John Foster and Mathew Wedel are planning a full scientific description of the *Brachiosaurus* fossils, and Brian Engh is working on a much longer and more ambitious follow-up to our first YouTube video.

### **Future Research Needs**

Among the most scientifically significant fossils at the Tal Site are vertebrae that may belong to *Apatosaurus* and *Barosaurus*, and what appears to be an articulated partial skeleton of *Haplocanthosaurus*. Ideally, we would like for these specimens to be safely excavated and conserved in a museum, but the challenges of removing the fossils from the hard sandstone and transporting them to the nearest road have kept us from attempting to collect them. However, our successful use of horses in recovering the *Brachiosaurus* fossils opens up a new possibility, that we could use horses to haul in the necessary heavy equipment and haul out the fossils. This is a possibility that we are continuing to explore with John Foster, who holds the surface collecting and excavation permits for the Tal Site study area.

### **References**

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