Report of work conducted for CNHA 2014 award:

Excavation of New Fossil Vertebrate Localities in the Upper Jurassic Morrison and Upper Cretaceous Cedar Mountain Formations

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Principal Investigator

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Field Team

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Lisa Herzog (paleontology lab manager NCMNS)
Susan Drymala (NCSU graduate student)
Khai Button (NCSU graduate student)
4 NCSU undergraduate students in training
Various NCMNS volunteers
CLDQ summer interns

The NCMNS and NCSU expedition team departed Raleigh in two 4x4 vehicles on July 24th, arriving to set up camp in central Utah on July 26th. The following day we opened two Mussentuchit Member (Upper Cretaceous) quarries discovered in 2013: 1) Big Daddy and 2) Suicide Hill, as well as a Upper Jurassic Morrison Formation site, 3) Black Bird Quarry (formerly known as the Watt Site), discovered and partially excavated by amateur collectors in 2013. During prospecting we discovered several new localities targeted for exacavation in 2015 including a site preserving a new species of tenontosaur-grade ornithopod, termed 4) Fortunate Son.

1) **Big Daddy (figs 1, 2)** was known to contain the partial skull of *Eolambia*; however, it was unknown how much more of this skeleton was preserved at this site. We collected several skull fragments in 2013 that are currently being prepared in the lab. We spent several days removing overburden at this site and discovered much more bone here including several nice skull elements from what may be the largest *Eolambia* individual with a preserved skull yet known. Although *Eolambia* is known from several localities, few skeletally

Figure 1. Big Daddy after opening day. Crew includes Cheif Preparator Lisa Herzog, graduate and undergraduate students in training.

Figure 2. A large premaxilla (part of the upper beak of this duck-bill dinosaur) exposed at Big Daddy. This bone will be one of our high priority specimens in the lab this year.

mature materials have been collected especially skull materials, rendering this locality particularly important for understanding the anatomy of this species. We continued to excavate here for the duration of the four-week period, collecting 32 individual elements (mostly skull bones and vertebrae) and two large jackets containing multiple bones. There is a great deal more bone at Big Daddy, no doubt including more skull materials that remain at the site. We will return here in 2015, open a larger area of the quarry and continue collecting from this individual. The materials we collected are currently on display in our on-exhibit preparation lab. We will continue to prepare these materials in front of the public. They will ultimately be described by PGL staff (PI Zanno and Gates) along with colleagues.

2). **Suicide Hill (Fig. 3)** proved equally productive. The bone here is preserved within a thin layer of mudstone, occasionally dipping into a 6-inch sandstone bed below. The bones are dense and jumbled further complicating their removal. Excavations at Suicide Hill are quite difficult; we therefore used a rock saw to collect several large jackets containing multiple bones that were partially imbedded in the sandstone. We collected a total of 79 jackets at Suicide Hill over a 3-week period. These bones represent a juvenile ornithopod, likely *Eolambia* and are generally in excellent condition. Much of the skeleton appears to be present including limb, pelvis, and

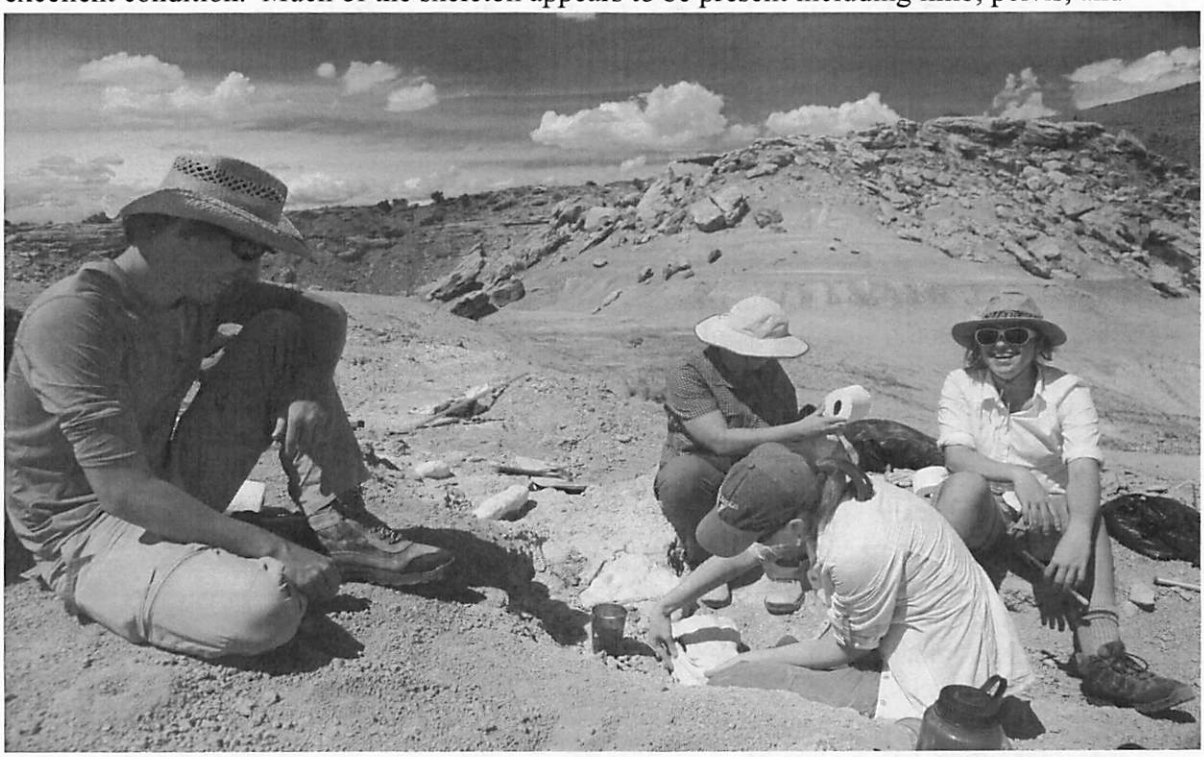

Figure 3. Local university undergraduates train at Suicide Hill.

vertebrae. There is more bone extending into the hill and we will return to collect more from this locality in 2015. Remaining elements were capped and buried in at the site.

3) **Black Bird Quarry (figs 4,5)** was initially discovered by a local family in the summer of 2013. A partial, articulated vertebral column of a sauropod was exposed on the surface. Only a very small portion (<2 sq feet) of these vertebrae was actually exposed on discovery. We were cautiously optimistic about the condition of the fossils when we went to open up the site. To our dismay the family excavated a huge area of bone (>6 feet long) before the site was reclaimed by the BLM. Because of that exposure and untrained excavation, the exposed side of the vertebral block suffered heavy damage. We removed the cap put on by the BLM summer of 2013 to assess the site and began excavations here, salvaging the damage on the exposed block and uncovering many more vertebrae, chevrons, ribs, and other unidentified materials in the process. The large block of nine articulated vertebrae could not safely be separated and was collected in one 2000 lb. plaster jacket. In total we collected 28 plaster jackets from this site and were extremely pleased with the quality of the unexposed bone we collected. There is more sauropod material remaining at BBQ, including what is possibly a portion of the pelvis. These materials were capped and buried in and remain at the site. We will return to BBQ in the summer of 2015. Because we were cognizant not to expose bone in the field, we do not yet know which species of Morrison sauropod is preserved at BBQ.

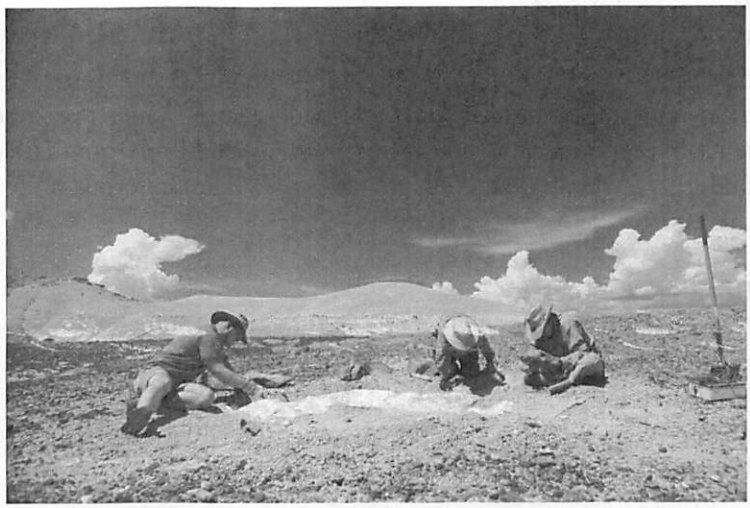

Figure 4. Exposing the BLM cap at Black Bird Quarry.

Figure 5. The big jacket ready for transportation back to Raleigh.

4) Fortunate Son was discovered by an Appalachian State undergraduate student this summer. The site contains a new species of primitive duck-bill dinosaur. This site is hands-down the best locality we have discovered during the Mussentuchit Dinosaur Project, in terms of bone quality and parts of the skeleton represented. We surface collected portions of the tail, forelimb, and skull. The bone here is excellently preserved. We collected a variety of skull bones from our test pit including a premaxilla, maxilla, and dentary bearing teeth. We also collected hind limb

elements and vertebrae from the test pit. It would appear a near complete skeleton of a new species is preserved at this site. We are excited to return here in 2015 with an excavation permit and collected the rest of this new animal.

Research Impact:
We collected a total of 4,150 lbs. of plaster jackets during our four-week expedition. The materials collected this year include teeth and bones from a minimum of five species of dinosaurs including three undescribed species. Once prepared these specimens will result in at least five publications involving graduate and undergraduate students. We also trained four undergraduate students in field methods. The materials collected will provide undergraduate thesis projects for these students.

Broader Impacts:
In keeping with our science communication goals, we blogged (www.expeditionlive.org) and tweeted (@Exeditionlive) live from the field for the duration of our expedition. We also live streamed back to the on-exhibit theater in the NC Museum of Natural Sciences three times during August (fig. 6). Zanno also visited Moab to give a talk to the Moab Friends of Paleontology on July 30th.

Figure 6. Zanno talks to visitors at the NC Museum of Natural Sciences, live during the 2014 expedition.

The NC Museum of Natural Sciences is hosting the travelling exhibition "Worlds Largest Dinosaurs" October 2014 through April 2015. As part of our outreach effort this year, we collected sauropod materials from the BBQ quarry to prepare on exhibit in our lab for visitors, and will use the large sauropod jacket in our social media campaign to get people excited about coming to the museum. Several videos were produced about our expedition that will be posted online and used as exhibition content. Zanno will also use this footage in her regular talks to kids live at the museum.

2014 Expenses charged

Airfare for volunteers: $578
Hotel: $504.12
Travel other: $110
Tolls: $11.50
Field equipment: $1,622.40
Food: $1363.36
Gasoline: $134.60

Total awarded $5,000
Total charged $5073.98
Balance: $0

Cost Sharing Summary:
NCSU: $4,611.57
NCMNS: $10,400.00
CNHA: $5,000