Distribution and Significance of Mesozoic Vertebrate Trace Fossils in Dinosaur National Monument

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✦ Introduction

Dinosaur National Monument (DINO) encompasses an area that has rocks with a high potential for preservation of vertebrate trace fossils, especially dinosaur tracks. The purpose of this research is to document the presence, type, and distribution of vertebrate trace fossils in Mesozoic rocks exposed in DINO. These rocks include the Moenkopi Formation, Chinle/Popo Agie Formation, Glen Canyon Sandstone, Carmel Formation, Entrada Sandstone, Morrison Formation, Cedar Mountain Formation, Dakota Formation, and Frontier Formation. This study will increase our knowledge of the stratigraphic and geographic distribution of vertebrate tracks as well as provide taxonomic, behavioral, and paleoenvironmental data.

During the 1990 field season, reconnaissance of the western part of DINO revealed the presence of vertebrate trace fossils in the Chinle/Popo Agie Formation. In addition, our examination of the Moenkopi Formation suggests that vertebrate tracks are probably present in this unit. Locality information was also obtained for probable track-sites in the Carmel Formation, Entrada Sandstone, and Morrison Formation.

✦ Field Methods

Reconnaissance exploration for vertebrate track-sites in DINO was undertaken by Martin G. Lockley, R. Farley Fleming, and Kelly Conrad from June 7-12, 1990. The June field reconnaissance was restricted to the Triassic Moenkopi and Chinle/Popo Agie Formations in the western part of DINO.

Rowley et al. (1979) used the term Chinle for Late Triassic red beds in DINO. Lockley (1986) and Lockley and Conrad (1987; 1989) have used the term Popo Agie following the terminology of High and Picard (1969). In this report, the term Chinle/Popo Agie is used to designate this unit within DINO.

The Moenkopi and Chinle/Popo Agie Formations are exposed along the flanks of the Split Mountain anticline. Exposures of these units form extensive strike valleys surrounding Split Mountain and are thus readily accessible for reconnaissance. The Moenkopiand Chinle/Popo Agie Formation exposures were examined within these valleys extending along Red Wash from approximately latitude 40°26'45"N and longitude 109°17'30"W, northwest to latitude 40°28'45"N and longitude 109°20'00"W.

Detailed geographic and stratigraphic information was collected for localities with unequivocal vertebrate tracks. Latex molds were made of well-preserved tracks and some specimens were collected and deposited at DINO headquarters. In accordance with park policy, we have photographed all vertebrate tracks localities.

✦ Preliminary Results

We did not observe well-preserved vertebrate tracks during reconnaissance of the Moenkopi Formation in Red Wash. However, a few possible tracks were observed in rocks that contained burrows of the ichnogenus *Scoyenia*, an invertebrate trail that often occurs with vertebrate trace fossils.

Four track sites were discovered in the Chinle/ Popo Agie Formation and given locality numbers (Table 1).

Locality	Latitude	Longitude	Member
UCD90-1	40°27'45"N	109°19'40"W	Red siltstone mbr
UCD90-2	40°26'52"N	109°19'50"W	Upper mbr
UCD90-3	40°28'04"N	109°20'00"W	Upper mbr
UCD90-4	40°27'29"N	109°20'07"W	Sandstone and conglomerate mbr

Table 1.Geographic and stratigraphic data for vertebrate track localities in the Chinle/Popo Agie formation.

Locality UCD90-1

Locality UCD90-1 occurs 6-7 m above the base of the red siltstone member of the Chinle/Popo Agie Formation. At this horizon, two small tridactyl tracks are poorly preserved on the top of a sandstone bed. The tracks are about 7 cm long and 6 cm wide. The track impressions are deep, indicting a very wet substrate at the time of trackmaking.

Locality UCD90-2

Locality UCD90-2 occurs approximately 1.5 m below the top of the upper member of the Chinle/Popo Agie Formation. This locality contains several tracks and includes at least two ichnospecies. The first species is *Brachychirotherium* sp. and includes both manus and pes impressions (Figure 1A). The pes is 17-18 cm long and 12-13 cm wide; the manus is about 8 cm long and 9 cm wide. A latex mold was taken of one of the better tracks of *Brachychirotherium* sp. The second species is represented by a single therapsid track that has not been named.

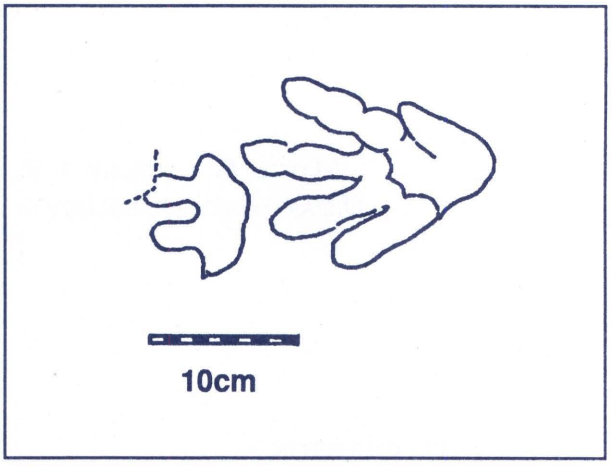

Figure 1A. Brachychirotherium *sp. manus/pes set from locality UCD()-2*

Locality UCD90-3

Locality UCD90-3 occurs about 8 m below the top of the upper member of the Chinle/Popo Agie Formation and has an excellent trackway of *Brachychirotherium* sp. (Figure 1B). The tracks are preserved on the upper surface of a thin sandstone bed. The trackway is about 4 m long and includes 6 manus/ pes sets. Preservation of individual tracks is fair.

Locality UCD90-4

Locality UCD90-4 occurs near the base of the sandstone and conglomerate member of the Chinle/ Popo Agie Formation. Six tridactyl tracks of *Grallator* sp. are preserved on the underside of a thick sandstone bed. These well-preserved tracks form a trackway approximately 3-4 m long. Individual tracks are estimated to be 12-13 cm long and 9-10 cm wide; the step is about 70 cm. We plan to make a latex peel and replica of this trackway.

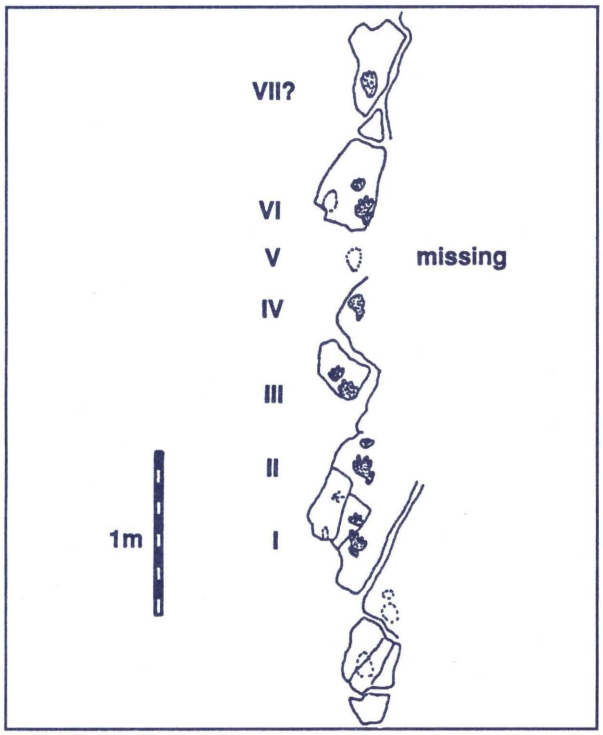

Figure 1B. Brachychirotherium *sp. trackway from locality UCD90-3.*

✦ Interpretations

Tracks have only previously been documented from two localities in the Chinle/Popo Agie Formation; the first in Wyoming (Branson and Mehl, 1931) and the second in Colorado (Lockley, 1986). The discoveries reported herein therefore double the known number of known localities. Moreover they represent the first reports from Utah, and the first reports of *Brachychirotherium, Grallator,* and a therapsid track from this formation.

Brachychirotherium is an important Late Triassic (Carnian to ? early Norian) zone fossil (ichnite). It is known from the Chinle of Utah (Lockley, 1986) and the Dockum of New Mexico (Lockley and Conrad, 1987). The discovery of this ichnogenus at DINO helps confirm that beds in the sequence between UCD90-2 and UCD90-3 are Carnian to Norian in age.

From a paleoecological point of view, the addition of three new track types doubles the diversity of vertebrate forms know from tracks in this formation.

✦ Literature Cited

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