

## BIRD TRACKS FROM THE LATE PALEOCENE OF NORTH DAKOTA

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Fossil birds are relatively rare, and Paleocene forms are particularly so. Worldwide, only 11 genera are known (1, 2). In addition to the body fossils, only three bird track sites of Paleocene age, all of which are from North America, have been reported (3-5). This communication is a report of the first fossil bird tracks known from North Dakota and the second record of birds in the Paleocene of the state. The tracks were first noted by Perkins (6) during a sedimentological study of the Bullion Creek Formation, but he made no attempt to collect or identify them.

The fossils are preserved on the upper surface of a very fine-grained, quartzose, silty sandstone. The block that holds the prints was not in place, but its exact provenance could be determined. The locality (L6421) is in Billings County (sec. 27, T. 142 N., R. 102 W.), an estimated 35 m below the Bullion Creek-Sentinel Butte formational contact. The sandstone is laterally persistent and approximately 0.3 m thick. Preliminary reconnaissance did not locate tracks at other exposures of the sandstone. The age of the locality is interpreted to be Tiffanian 4 (late Paleocene) based upon the presence of *Plesiadapis churchilli* at Wannagan Creek Quarry (7, 8). Wannagan Creek Quarry, also in Billings County, is approximately 20 m below the top of the Bullion Creek Formation and has produced the only other record of Paleocene birds from North Dakota (9, 10).

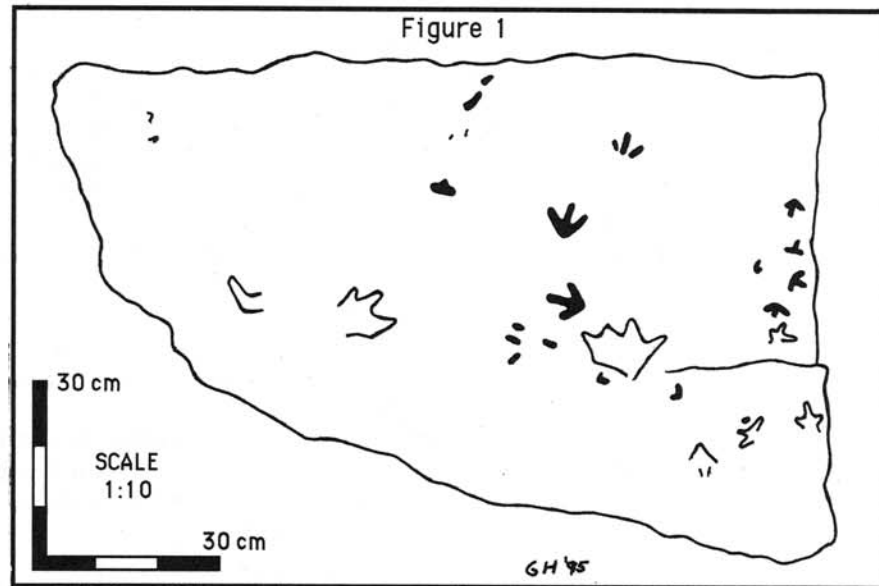
There are two distinct sizes of tracks (Figure 1). Three larger tracks (Type 1) range from 70 to 77 mm long (measured along the axis of digit III) and 70 to 72 mm wide (maximum width between digit II and digit IV). There is no indication of webbing on any of the Type 1 tracks, and there is no clear indication of a hallux. The deepest of the tracks has only a faint indentation in the area of the hallux, but it is not entirely clear that it is part of the same track. The divergence angle (angle between digit II and digit IV) is relatively low, ranging from 84° to 90°. In addition to the measurable Type 1 tracks, there are two wide, poorly defined prints of the same general size. These may be overprints, where the foot was placed in nearly the same position more than once, or they may have been made if some of the mud matrix adhered to the foot when it was lifted, obscuring the imprint. The smaller tracks (Type 2) are more numerous and more variable. There are five measurable tracks, ranging from 38 to 40 mm long and from 45 to 55 mm wide. None of the Type 2 tracks show any indication of webbing or of a hallux imprint. The divergence angle ranges from 89° to 147°. There are several additional prints of the same general size as Type 2 tracks. In some cases these are impressions of one or two toes. In two cases, the prints are poorly defined, suggesting that these are overprints or that mud adhered to the foot when it was lifted.

In addition to the bird tracks, the bedding surface preserves numerous small invertebrate traces, possibly representing the food that attracted either or both of the bird species. Several deeper impressions on the surface do not appear to be foot prints. A set of three closely spaced triangular gouges could represent marks made during feeding, perhaps by the larger species.

Suggestions on the identity of the track makers can be made. The Charadriiformes (plovers and sandpipers) are known from the Late Cretaceous (1). The Gruiformes (rails and cranes) are known from the Paleocene (2). Species from either of these groups could have made either or both types of tracks.

Particularly intriguing are the occurrences of *Dakotornis cooperi*, an ibis-like bird, along with possible charadriid and rallid species from the Wannagan Creek Quarry (9, 10). Although it is not possible to say that the bird tracks represent the same species as the body fossils found at Wannagan Creek Quarry, taken together they do indicate a moderately diverse avian fauna in the late Paleocene of North Dakota.

The specimen was collected under a permit issued by the Custer National Forest of the US Forest Service (AJK). Support for the collection of the specimen was provided by the Energy & Environmental Research Center, University of North Dakota, where the specimen will be displayed.



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