



Fossil Bird Diversity



A slab of rock contains fossil tracks of a newly-discovered heron- or crane-like bird species. Paleontologist Tony Fiorillo has named the large-tracked bird *Magnoavipes denaliensis* to honor the mountain in the shadow of which the tracks were found.

The sedimentary rocks of the lower Cantwell Formation in Denali National Park and Preserve harbor a bonanza of fossils from about 70 million years ago. Not only are there tracks of an array of dinosaur types (theropod including bird, hadrosaur, and ceratopsian), there are also fossil traces of flora and other fauna—including pterosaurs, a group of flying reptiles related to dinosaurs—that coexisted with dinosaurs in the Late Cretaceous Period.

Fossil bird footprints in the park are well-preserved and amazing in their diversity. So says Dr. Tony Fiorillo, paleontologist and curator of fossils at the Perot Museum of Nature and Science in Dallas, who has spent several research weeks in Denali each year since the first dinosaur track was found in 2005.

Each summer, he is delighted to add new discoveries to the accumulating knowledge of life in the Late Cretaceous. Along with park staff, summer Geological Society of America interns, and paleontology colleagues, Fiorillo has been conducting systematic searches for fossils in the lower Cantwell Formation, a roughly east-west band stretching through a section of the park. Sites of fossil bird finds are (from east to west) Fang Mountain, Double Mountain, Sable Mountain, and Cabin Peak. Several interesting findings have emerged as Fiorillo has studied fossil bird tracks at all four sites:

(1) Based on fossil bird tracks found in Denali, Fiorillo has declared that the lower Cantwell Formation in Denali has the richest record of fossil bird diversity from a single rock unit in the world.

(2) Small dimples amongst shorebird-like tracks and water ripple marks appear to be traces where birds probed the mud with narrow bills—early fossil evidence of feeding behavior.

(3) Enough differences exist between some of the bird tracks found in Denali and known tracks elsewhere in the world to attribute two types of Denali fossil bird tracks to new species.

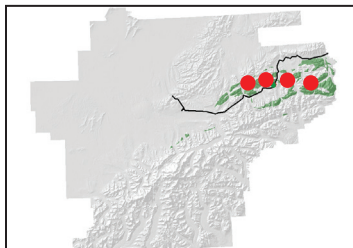
(4) Because some of the fossil bird tracks found in Denali are also found elsewhere in the U.S. and Asia, these birds likely used Alaska as a seasonal nesting ground some 70 million years ago, just as modern birds that nest in Denali migrate from around the globe.

Bird diversity in Denali

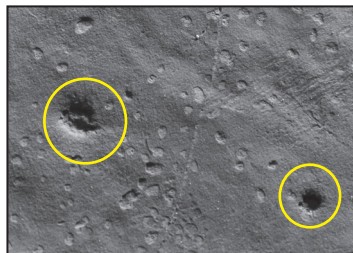
The fossil bird tracks found in Denali range from the size of a sparrow to that of a very large heron. Because the lower Cantwell Formation was deposited near its current latitude in Denali, the bird track fossils found in this unit are the highest latitude (i.e., most polar) fossil bird tracks known at this time.

So far, Fiorillo and others have found several hundred bird tracks and several dozen traces of bill probes made during feeding. Bird tracks have been found in deposits believed to have been laid down near lakes and rivers. Because of the thickness of the sedimentary rock unit (thousands of meters or several thousand feet), there are many bedding planes that could contain dinosaur or bird tracks. Some bird tracks are associated with dinosaur tracks in the same

Rocks of Denali...provide the richest record of avian biodiversity from a single rock unit anywhere in the world.



Bird tracks have been found in four localities (red dots) across the lower Cantwell Formation (green) in Denali.



Fossilized "dimples" (circled in yellow) indicate where ancient birds probed in mud for food.

rock plane, and some are in layers between those that contain dinosaur tracks.

Some characteristics of fossil bird tracks that are used to identify the species or to compare them to previously described fossil bird tracks are the number of toes, the curvature of the toes, whether a toe points backward, and the presence of webbing or toe pads.

The tracks are not directly correlative with modern living birds. However, many are similar to birds in the modern order Charadriiformes (shorebirds and relatives, such as the Spotted Sandpiper). *Ignotornis* had feet with four toes—three pointed forward and one extended back. Tracks of *Aquatilavipes* have three toes, all pointing forward. Bird tracks attributed to *Uhangrichnus* have webbed feet similar to those of a duck.

Tracks of new fossil bird species

Two new species of birds were described based on their fossil tracks. Huge heron- or crane-like tracks were placed in the same genus that had been described elsewhere (*Magnoavipes*), but the tracks were too large to be those of any previously described species. Fiorillo selected the name for the

new bird species, asking, "What better name for the new fossil bird with huge tracks than *denaliensis*—named for the mountain that is the 'high one,' located in the same park where the fossil was discovered?"

A new fossil bird species of *Gruipeda* was also named based on the size of the track. The species name *vegrandiunus* means "little one," and the tracks are smaller than described for previously named species (see photo and diagram below).

Where fossil bird tracks are found in the world

The assemblage of bird track fossils found within the lower Cantwell Formation includes bird tracks found in Asia, North America, or both continents. This overlap of distribution suggests that some birds used Alaska as a bridge to migrate between Asia and North America. It also implies that birds have migrated to Alaska from elsewhere for millions of years.

For more information

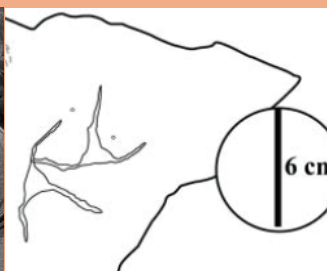
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Catalog of 70-million-year-old fossil bird tracks found in Denali



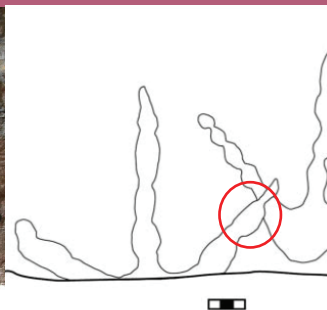
Ignotornis

Ignotornis had four toes, three pointing forward and one to the rear, similar to a sandpiper (shorebird). Small depressions are bill marks made while feeding in the mud.



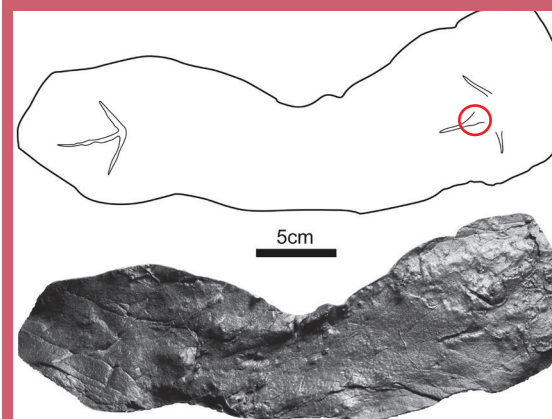
Aquatilavipes

More than 30 tracks have been found and measured. These birds had three toes.



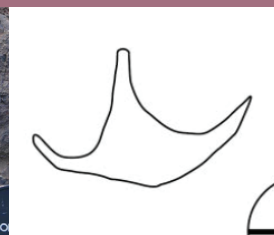
Magnoavipes denaliensis

This new species of fossil bird was a large heron-like bird with three toes and toe pads (see pad within red circle).



Gruipeda vegrandiunus

Gruipeda vegrandiunus is a new species of fossil bird, named because the tracks are small (*vegrandiunus* means "little one"). Traces of webbing are present (see webbing in red circle).



Uhangrichnus

Tracks of *Uhangrichnus* show what is thought to be webbing between the digits. The outer digits curve toward the central one. Two sizes of these tracks have been found.