

## Evolution & Behavior

# What were the ice age ‘stilt-legged’ horses of North America?

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### ABSTRACT

Were these extinct animals related to horses, donkeys, or zebras, or were they something else entirely? Using ancient DNA, we have finally solved this mystery.



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The horse family, which includes horses, zebras, and donkeys, is more than 50 million years old. During its early years, members of this group were the size of dogs and had three toes. Over time, they became the large, one-toed animals we know today. But it was not such a simple story. The rich fossil record of the horse family shows that there were many offshoots along the way that are now extinct. And our one-toed stilt-legged horses were one of them. But what were they?

During the ice ages, there were two groups of horses that roamed North America. One group had broad foot bones, very much like the horses that are alive today. The other group, the [stilt-legged horses](#), had much more slender foot bones. These foot bones look very similar to those of the living Asiatic asses,

such as the [Tibetan Kulan](#) and [Persian Onager](#), which are related to donkeys. For this reason, paleontologists had long considered stilt-legged horses to be most closely related to Asiatic asses.

However, studies that compared small amounts of ancient DNA extracted from stilt-legged horse bones to DNA from all living horses, zebras, and donkeys found that stilt-legged horse DNA was more similar to that of living horses, rather than donkeys or asses. Paleogeneticists, or scientists who study ancient DNA, therefore suggested that stilt-legged horses were most closely related to regular horses.

So, who was right? The answer, it turns out, is neither. In our study, we used much more ancient DNA from stilt-legged horse bones than had

previously been extracted. Armed with this far larger data set, we found that stilt-legged horses are not closely related to horses, donkeys, or zebras, but instead fall outside of this diversity.

The genus *Equus* is the name given to the group comprising all living horses, zebras, and donkeys. As all previous work, by paleontologists and paleogeneticists alike, had found that stilt-legged horses fell within this diversity, they were considered members of this group. But, because we found that stilt-legged horses actually fall outside of this diversity, they are not members of this group and so do not belong in the genus *Equus*. We therefore named a new genus for the stilt-legged horses, which we call *Haringtonhippus*. This translates to Harington's horse and is named in honor of the paleontologist who first discovered stilt-legged horse bones from northwestern Canada, Dick Harington.

No new genus is complete without a designated, or type, species name, however. We therefore had to decide which of the nine species names previously given to stilt-legged horses was best suited for our new genus. We settled on the name *francisci*, and so the full name for the stilt-legged horses is *Haringtonhippus francisci*.

By looking at how different the DNA from *Haringtonhippus* and *Equus* is, we were able to

calculate that these two genera last shared a common ancestor around four million to six million years ago, at a time when many other horse groups still had three toes!

Much like the [giant ground sloth](#), [saber-toothed cat](#), and [dire wolf](#), both the broad-footed and stilt-legged horses of North America became extinct at the end of the last ice age. In northwestern Canada however, it was instead thought that the stilt-legged horses went extinct much earlier, before the height of the last ice age. During the course of our study, we found a bone from a stilt-legged horse that showed this group actually survived in northwestern Canada until much later, nearer the end of the last ice age. This means that whatever killed off the other large animals at the end of the last ice age may also have been responsible for the extinction of stilt-legged horses in northwestern Canada.

Although they went extinct in North America, the broad-footed horses survived in Europe and Asia and were eventually domesticated into the horses that we know today. The stilt-legged horses were not so lucky. They only ever lived in North America, and so it was game over when they disappeared from that continent. After a long period of absence, horses once again roam North America following the introduction of domestic horses by the Spanish in the late 15<sup>th</sup> Century.