

Ancient DNA identifies donkey ancestors, people who domesticated them

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Genetic investigators say the partnership between people and the ancestors of today's donkeys was sealed not by monarchs trying to establish kingdoms, but by mobile, pastoral people who had to recruit animals to help them survive the harsh Saharan landscape in northern Africa more than 5,000 years ago.

The findings, reported today by an international research team in [Proceedings of the Royal Society B](#), paint a surprising picture of what small, isolated groups of people were able to accomplish when confronted with unpredictable storms and expanding desert.

"It says those early people were quite innovative, more so than many people today give them credit for," said senior author Connie J. Mulligan, Ph.D., an associate professor of anthropology at the University of Florida and associate director of the UF Genetics Institute. "The [domestication](#) of a wild animal was quite an intellectual breakthrough, and we have provided solid evidence that donkey domestication happened first in northern Africa and happened there more than once."

Sorting through the most comprehensive sampling of mitochondrial DNA ever assembled from ancient, historic and living specimens, scientists determined that the critically endangered African wild ass -- which today exists only in small numbers in eastern Africa, zoos and wildlife preserves -- is the living ancestor of the modern donkey.

What's more, researchers found evidence to suggest that a subspecies

called the Nubian wild ass, presumed vanished late in the 20th century, is not only a direct ancestor of the donkey -- it may still exist.

The ancestors of the domestic donkey were considered vital for collecting water, moving desert households and creating the first land-based trade routes between the ancient Egyptians and the Sumerians, according to study co-author Fiona B. Marshall, Ph.D., a professor of anthropology at Washington University in St. Louis.

An Old World prehistorian, Marshall has documented evidence of the donkey's domestic service by looking at skeletal wear and tear of animal remains found entombed near Egyptian pharaohs.

In the new study, scientists traced the family trees of the domestic donkey using samples from living animals, skeletons of African wild ass held in museums worldwide and isolated donkey bones from African archaeological sites.

"These were the first transport animals, the steam engines of their day," Marshall said. "Today domestic donkeys are often conceived of as animals of poor people, and little is known about their breeding. This is the first study to determine the African wild ass, which includes the Nubian strain, is the ancestor of the domestic donkey. That's important to know for efforts to preserve the species."

There are small numbers of the Somali subspecies of the African wild ass in zoos and wildlife preserves, and about 600 still exist in the wild in Eritrea and Ethiopia, but the Nubian subspecies was last seen in the Red Sea Hills of Sudan late in the 20th century.

Hope for its continued existence springs from a sample collected in northern Africa in the mid-1990s by co-author and biologist Albano Beja-Pereira of the University of Porto, Portugal. If any Nubian

survivors are found, the possibility remains that the animals could be bred and reintroduced into the wild. The evidence reinforces the need for surveys and wildlife management plans in eastern Sudan and northern Eritrea, researchers say.

"The whole idea behind conservation is the need to maintain genetic variation," Mulligan said. "We don't know which elements are more or less important, but we think the whole range of diversity is important to the health of the species. Knowing the genetic makeup of the animals is essential to protect that diversity."

In addition, placing the domestication of the donkey in northern Africa helps scientists better understand the archaeological record and early culture of the area, researchers say.

"Knowing where a domestication event first occurred is important, because there are always cultural ramifications from being first," said Sandra Olsen, Ph.D., curator of anthropology at the Carnegie Museum of Natural History in Pittsburgh, who did not participate in the research. "With a nucleus of animals that can serve as either a food source, transportation or some other purpose, particular cultures acquire advantages that make them more successful than their neighbors. Consider that animals like the horse and the donkey were used for military purposes.

"From the point of view of a biologist or someone who studies animal husbandry, it is interesting to find the source for a species because it can even have veterinary ramifications," she said. "The work done in this project is extraordinary. They located very hard to find samples not common at all in museums, and the archeological specimens are difficult to obtain positive results from because the heat often destroys the organic material. They've made some considerable advances."

Besides revealing that the African wild ass is the living ancestor of today's domestic donkeys, the genetic evidence also reveals that the Somali wild ass is not a living ancestor as once suspected, but closer akin to a more modern cousin.

That leaves a question of a remaining, yet unidentified ancestor of modern donkeys believed to have sprung from a different branch of the family. Researchers suspect that ancestors of this animal are extinct, but they may have roamed the Maghreb of northeastern Africa, and possibly the coast of Yemen.

The research was initiated by funding from the National Science Foundation and also supported by the Wildlife Trust, St. Louis Zoo, Basel Zoo, Liberec Zoo and the Sea World and Busch Gardens Conservation Fund.

Conservation samples were collected by co-authors Patricia D. Moehلمان of the International Union for Conservation of Nature, Hagos Yohannes of the Eritrea Ministry of Agriculture and Fanuel Kebede of the Ethiopian Wildlife Conservation Authority.

Provided by University of Florida

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