

Discovery of an ancient dog species may teach us about human vocalization

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Photograph taken of a Highland Wild Dog in Indonesia. Credit: New Guinea Highland Wild Dog Foundation

In a study published in *PNAS*, researchers used conservation biology and genomics to discover that the New Guinea singing dog, thought to be extinct for 50 years, still thrives. Scientists found that the ancestral dog population still stealthily wanders in the Highlands of New Guinea. This finding opens new doors for protecting a remarkable creature that can

teach biologists about human vocal learning. The New Guinea singing dog can also be utilized as a valuable and unique animal model for studying how human vocal disorders arise and finding potential treatment opportunities. The study was performed by researchers at the National Human Genome Research Institute (NHGRI), part of the National Institutes of Health, Cenderawasih University in Indonesia, and other academic centers.

The New Guinea singing dog was first studied in 1897, and became known for their unique and characteristic vocalization, able to make pleasing and harmonic sounds with tonal quality. Only 200-300 captive New Guinea singing [dogs](#) exist in conservation centers, with none seen in the wild since the 1970s.

"The New Guinea singing dog that we know of today is a breed that was basically created by people," said Elaine Ostrander, Ph.D., NIH Distinguished Investigator and senior author of the paper. "Eight were brought to the United States from the Highlands of New Guinea and bred with each other to create this group."

According to Dr. Ostrander, a large amount of inbreeding within captive New Guinea singing dogs changed their genomic makeup by reducing the variation in the group's DNA. Such inbreeding is why the captive New Guinea singing dogs have most likely lost a large number of genomic variants that existed in their wild counterparts. This lack of genomic variation threatens the survival of captive New Guinea singing dogs. Their origins, until recently, had remained a mystery.

Another New Guinea dog breed found in the wild, called the [Highland Wild Dog](#), has a strikingly similar physical appearance to the New Guinea singing dogs. Considered to be the rarest and most ancient dog-like animal in existence, Highland Wild Dogs are even older than the New Guinea singing dogs.

Researchers previously hypothesized that the Highland Wild Dog might be the predecessor to captive New Guinea singing dogs, but the reclusive nature of the Highland Wild Dog and lack of genomic information made it difficult to test the theory.

In 2016, in collaboration with the University of Papua, the New Guinea Highland Wild Dog Foundation led an expedition to Puncak Jaya, a mountain summit in Papua, Indonesia. They reported 15 Highland Wild Dogs near the Grasberg Mine, the largest gold mine in the world.

A follow-up [field study](#) in 2018 allowed researchers to collect blood samples from three Highland Wild Dogs in their natural environment as well as demographic, physiological and behavioral data.

NHGRI staff scientist Heidi Parker, Ph.D., led the genomic analyses, comparing the DNA from captive New Guinea singing dogs and Highland Wild Dogs.

"We found that New Guinea singing dogs and the Highland Wild Dogs have very similar genome sequences, much closer to each other than to any other canid known. In the tree of life, this makes them much more related to each other than modern breeds such as German shepherd or basset hound," Dr. Parker said.

According to the researchers, the New Guinea singing dogs and the Highland Wild Dogs do not have identical genomes because of their physical separation for several decades and due to the inbreeding among captive New Guinea singing dogs—not because they are different breeds.

In fact, the researchers suggest that the vast genomic similarities between the New Guinea singing dogs and the Highland Wild Dogs indicate that Highland Wild Dogs are the wild and original New Guinea singing dog

population. Hence, despite different names, they are, in essence, the same breed, proving that the original New Guinea singing dog population are not extinct in the wild.

The researchers believe that because the Highland Wild Dogs contain genome sequences that were lost in the captive New Guinea singing dogs, breeding some of the Highland Wild Dogs with the New Guinea singing dogs in conservation centers will help generate a true New Guinea singing dogs population. In doing so, conservation biologists may be able to help preserve the original breed by expanding the numbers of New Guinea singing dogs.

"This kind of work is only possible because of NHGRI's commitment to promoting comparative genomics, which allows researchers to compare the genome sequences of the Highland Wild Dog to that of a dozen other canid species," Dr. Ostrander said.

Although New Guinea singing dogs and Highland Wild Dogs are a part of the dog species *Canis lupus familiaris*, researchers found that each contain genomic variants across their genomes that do not exist in other dogs that we know today.

"By getting to know these ancient, proto-dogs more, we will learn new facts about modern dog breeds and the history of dog domestication," Dr. Ostrander said. "After all, so much of what we learn about dogs reflects back on humans."

The researchers also aim to study New Guinea singing dogs in greater detail to learn more about the genomics underlying vocalization (a field that, to date, heavily relies on birdsong data). Since humans are biologically closer to dogs than birds, researchers hope to study New Guinea singing dogs to gain a more accurate insight into how vocalization and its deficits occur, and the genomic underpinnings that

could lead to future treatments for human patients.

More information: Suriani Surbakti et al., "New Guinea highland wild dogs are the original New Guinea singing dogs," *PNAS* (2020).

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