Team proposes an archetype specimen for all dingoes

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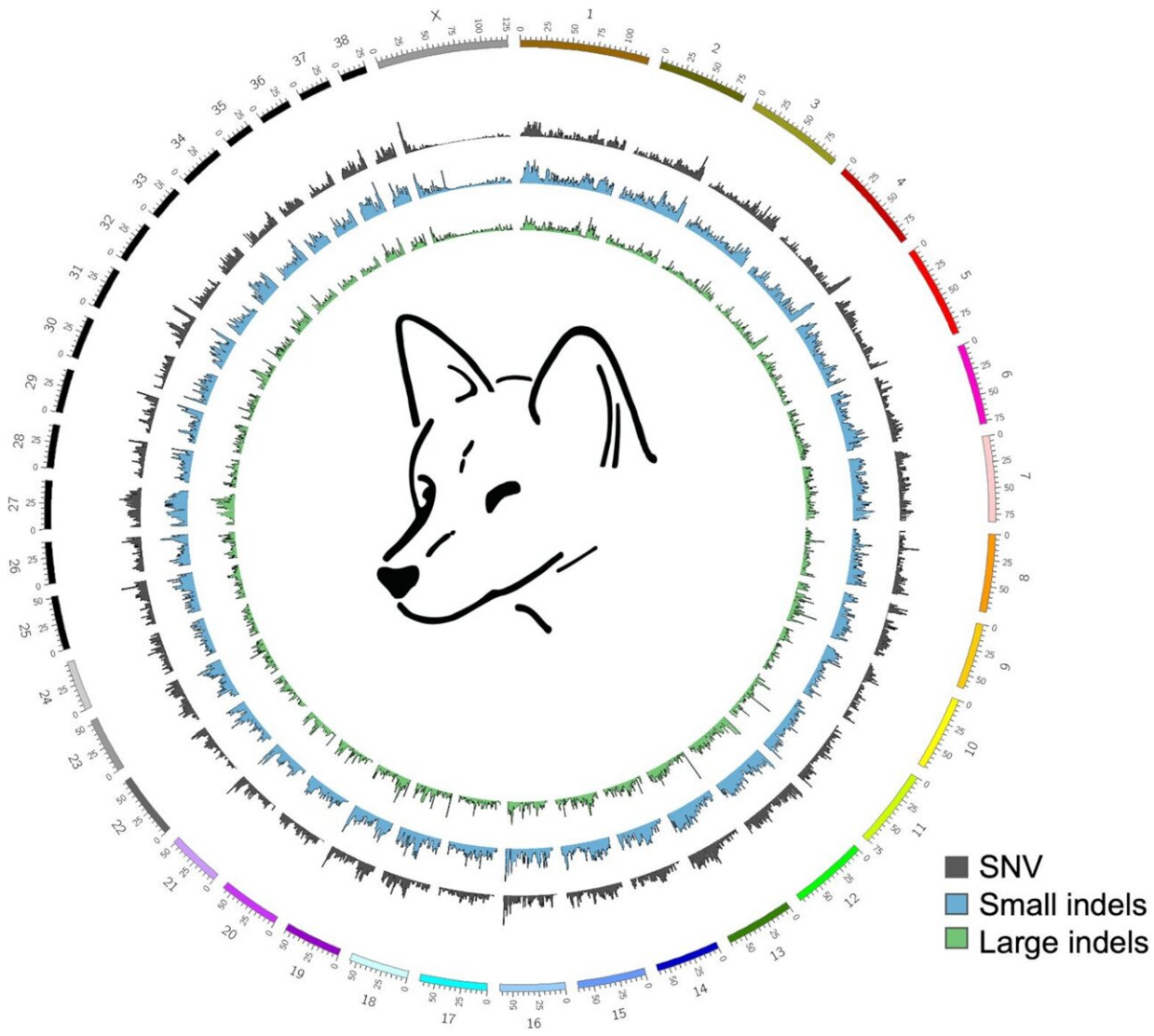

Circos plot comparing Alpine and Desert dingo genomes. Plot compares the 38 autosomes and X chromosome of the Alpine and Desert dingo. The plot shows

the low variation on the X chromosome compared to the autosomes. Credit: *GigaScience* (2023). DOI: 10.1093/gigascience/giad018

A taxidermy-prepared dingo named Cooinda has been proposed to serve as an "archetype" specimen for all dingoes. A newly published article provides detailed information on this individual, including a high-quality genome sequence, other molecular biology data, and magnetic resonance imaging of brain tissue.

Cooinda, and the rich data collected on it, now serve as a point of reference for exploring the evolutionary history of dingoes, and to better understand how and when humans influenced the breed's anatomy, genetics and behavior as step in the domestication process. This work was published in *GigaScience.*

The Australasian dingo presents a riddle to biologists: Are they feralized dogs? Or are they an intermediate between wild wolves and domesticated dogs? Dingoes came to Australia more than 5,000 years ago. When they first arrived—probably in the company of sailors—they likely already had a history of interactions with humans that shaped their behavior, their anatomy and their genes.

A team led by Bill Ballard (University of Melbourne) has just published a new study in the journal *GigaScience* to propose one taxidermy-prepared specimen, an alpine dingo named Cooinda, as the model specimen to represent a typical dingo that they call an "archetype." This designated type specimen can help to better understand the unique placement of the dingo between a wild and a fully domesticated species.

Earlier work has confirmed that dingoes are indeed an early offshoot of modern dog, between the wild wolf and today's domesticated dogs.

However, domestication is a long process, and it is possible the dingo is indeed partially marking an intermediate stage of domestication.

Charles Darwin was fascinated by the domestication of animals, and in fact observations on domesticated animals were a departure point when laying out his theory of evolution. Darwin proposed a two-step model of domestication: According to this idea, the first step is characterized by "unconscious" selection, leading to merely tamed rather than domesticated animals; followed in a second step by what biologists today call artificial selection.

The hallmark of the second stage is that humans deliberately interfere in mating and reproduction by soecifically selecting desired traits. The question then is whether the dingo is an example of a population that only made it to the first step in Darwin's model, but not the second?

Prof. Bill Ballard, first author of the new *GigaScience* study, explains, "Unfortunately, the absence of a dingo reference specimen impedes our ability to definitively determine whether dingoes are a tamed intermediate or a feral canid, because we do not have a single reference point that links the scientific name to a specific specimen."

The genomic and morphological data in the new study is based upon an Alpine Dingo named Cooinda from Dingo Sanctuary Bargo in New South Wales, Australia.

A previously published Dingo genome was based on another animal, Sandy, a Desert Dingo, and the new data also allow comparisons between the Alpine and Desert ecological types.

In addition to the high quality genome data, the Australian team also collected mitochondrial DNA sequences and DNA methylome data, and linked this molecular information with morphological analyses of head

shape, a trait specific to the dingo among canids, and magnetic resonance imaging of Cooinda's brain.

Along with other morphological changes, "domesticated animals often show reduced brain size compared to their wild relatives," notes study co-author Assoc. Prof. Laura Wilson (ANU). The brain analyses show that Cooinda had a larger cranial capacity than a similar-sized domestic dog.

Having such a data-rich and diverse characterization of a single individual makes Cooinda an ideal candidate to be considered the "archetype" for Dingo. She is now on display at the Australia Museum in Sydney.

More information: J William O Ballard et al, The Australasian dingo archetype: de novo chromosome-length genome assembly, DNA methylome, and cranial morphology, *GigaScience* (2023). DOI: 10.1093/gigascience/giad018

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