

MALGORZATA PILOT, PhD HUMAN-MODIFIED CANIDS IN HUMAN-MODIFIED LANDSCAPES

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Human-modified canids in human-modified landscapes: Evolutionary history of free-ranging dogs and their complex relationships with grey wolves

Domestication can be described as the adaptation to living in close proximity to humans, and therefore domesticated species may be expected to thrive in human-modified landscapes. Indeed, the domestic dog is the most widespread and numerous canid, with the global population estimated at 1 billion individuals, about 75% of which are free-ranging. In contrast to pure-bred dogs that constitute artificially maintained inbred lines, free-ranging dogs are typically free-breeding, i.e., unrestrained in mate choice. Many traits in free-ranging dogs may be under similar natural and sexual selection conditions to wild canids, which differentiates them from pure-bred dogs. Relaxation of natural and sexual selection in pure-breed dogs as opposed to FBDs could have led to mild changes in regulation of the Hedgehog signalling pathway. Hedgehog pathway regulates the migration of neural crest cells from the neural tube, and minor deficits of these cells during embryonic development have been proposed as the underlying cause of “domestication syndrome.” This suggests that the formation process of dog breeds involved the same genetic and developmental pathways as the process of wolf domestication.

Free-ranging dogs across Eurasia show limited genetic differentiation, which contrasts with the grey wolves that are characterised by strong genetic differentiation driven by habitat and prey differentiation. Domestication process has strongly modified the dietary niche of the dog as compared with their wild ancestor, and most free-ranging dogs at least partially rely on human-derived food sources, and occupy habitats where such food is available. Therefore, habitats and diet of free-ranging dogs are less differentiated across large geographic scales as compared with those of grey wolves, which in combination with continuity of human-modified habitats across Eurasia results in weak genetic structure. Modern dogs have East Asian origin, and have spread across Eurasia during the Neolithic human migrations. Therefore, in Eurasia the dog has been an integral part of an agricultural landscape. The spread of agriculture led to a secondary contact between dogs and grey wolves, sometimes resulting in hybridisation, as suggested by genome-wide patterns of haplotype sharing. While hybridisation frequently results in loss of fitness, in some cases dog-derived gene variants could facilitate adaptation of their wild owners to living in human-modified landscapes. This adaptive process may result in a shift of the ecological niche of wolves living in highly human-dominated landscapes from apex predators to scavengers of anthropogenic food, which may initiate a secondary wolf domestication process.

Małgorzata Pilot is a senior lecturer at the University of Lincoln, UK. Her research is focused on mammalian evolutionary genetics. She is carrying out a long-term project aimed at reconstructing the evolutionary history of the grey wolf and its domesticated subspecies, the domestic dog. More details of her work can be found on <https://staff.lincoln.ac.uk/mpilot>.