

Comment

# Colonization history and ancestry of northeastern coyotes

Recently Kays *et al.* (2010) reported on mitochondrial DNA (mtDNA) sequence data and skull measurements to demonstrate a hybrid origin for northeastern coyotes. They suggested that, as western coyotes (*Canis latrans*) expanded their range in the last century, they colonized Ontario from Minnesota and hybridized with wolves, and subsequently colonized the northeastern United States via movement across the Saint-Lawrence River. We support the

conclusion that northeastern coyotes are derived from wolf–coyote hybridization, and we agree that introduced adaptive variation resulting in larger body size and more wolf-like cranial features probably allowed them to better hunt deer and facilitated their colonization of the northeast. However, data do not support the proposed route of western coyote colonization into Ontario from Minnesota and we criticize their use of the term ‘Great Lakes wolf’ (GLW) in describing *Canis* species taxonomy. We provide mtDNA data from southern Ontario (SON) coyotes and refer to the literature to demonstrate that the most probable route of western coyote colonization was from the lower Michigan peninsula near Detroit into SON, where hybridization with eastern wolves (*Canis lycaon*) occurred (figure 1).

We observed 10 mtDNA haplotypes in our SON sample ( $n = 310$ ); two were of eastern wolf origin and the other eight were of coyote origin (see the electronic supplementary material, figure S1). The predominant haplotypes were C1, C9 and C19, with other haplotypes observed in low frequency, similar to the haplotype composition reported by Kays *et al.* in the northeast (figure 1; see the electronic

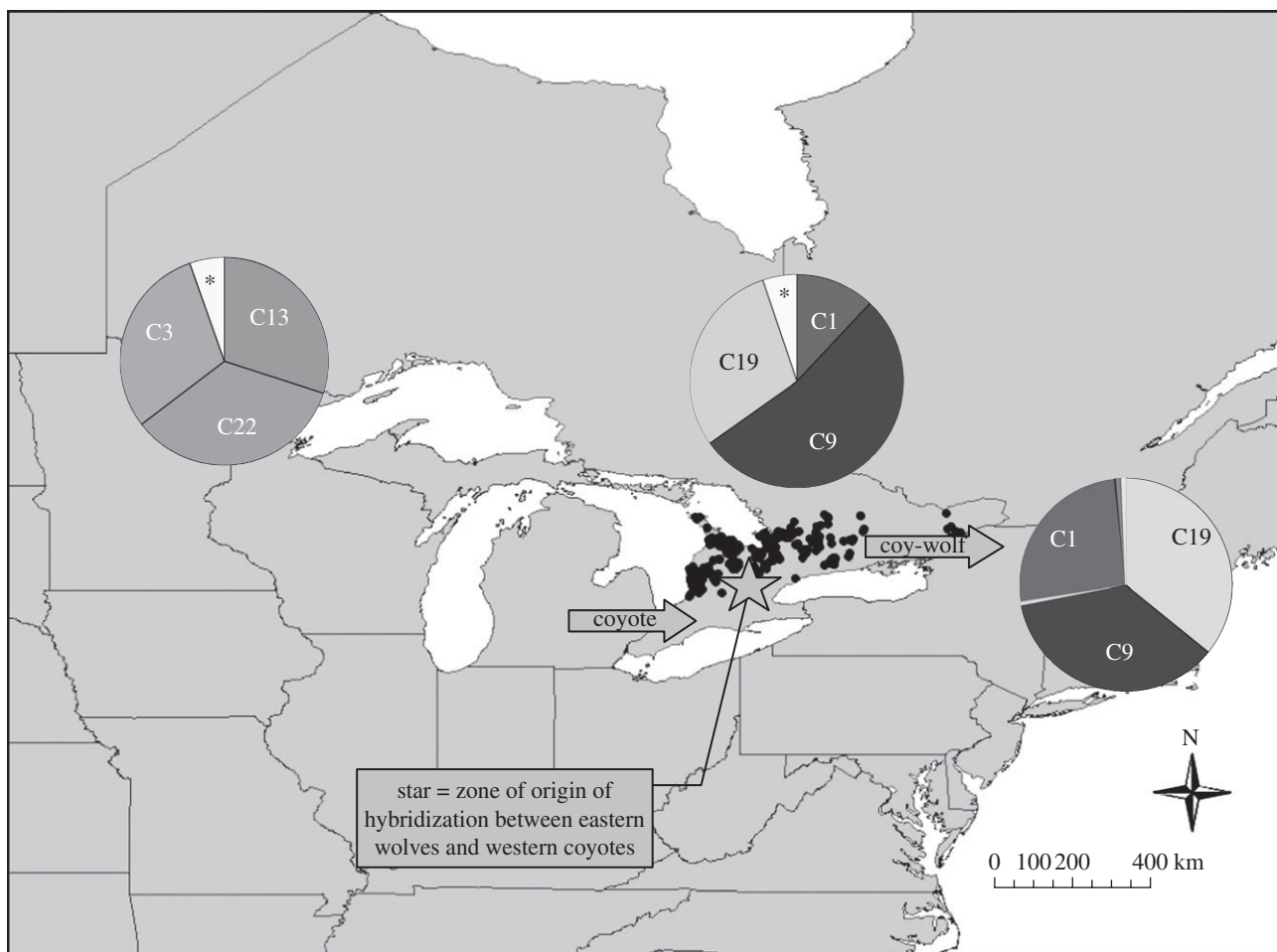


Figure 1. Sampling distribution of southern Ontario coyotes, and mtDNA haplotype frequencies of southern Ontario coyotes ( $n = 310$ ), northeastern coyotes ( $n = 453$ ; modified from Kays *et al.* 2010, fig. 2), and Minnesota/northwestern Ontario wolves ( $n = 130$ ; data from Wheeldon 2009). Asterisk in pie charts indicates combined low frequency haplotypes. Arrows indicate colonization paths.

The accompanying reply can be viewed on page 248 or at <http://dx.doi.org/doi:10.1098/rsbl.2009.1022>.

Electronic supplementary material is available at <http://10.1098/rsbl.2009.0822> or via <http://rsbl.royalsocietypublishing.org>

supplementary material, table S1). The haplotype composition of Minnesota and northwestern Ontario wolves is different from that of eastern coyotes (figure 1), and there is no morphological or biological evidence to support wolf–coyote hybridization occurring in the western Great Lakes region (Nowak 2009). Eastern wolf–western coyote hybridization has been extensive in SON, supported by genetic (Wilson *et al.* 2009) and morphological data (Sears *et al.* 2003), suggesting it is the probable origin of the wolf–coyote hybrids that colonized the northeast.

Way *et al.* (in press) also presented mtDNA sequences and microsatellite genotype data to demonstrate the hybrid nature of northeastern coyotes (*C. latrans* × *C. lycaon*). They used genetic distance measures to demonstrate the colonization path of ‘coywolves’ from southeastern Ontario into New York, followed by expansion into the northeast. This independent study confirms the hybrid nature of the animals reported by Kays *et al.* but supports western coyote colonization from the lower Michigan peninsula and hybridization in SON.

The use of the term GLW as a species designation by Kays *et al.* ignores literature on the eastern wolf, and perpetuates confusion over *Canis* taxonomy. Although Leonard & Wayne (2008) presented mtDNA data to demonstrate the GLW was a distinct species, Wheeldon & White (2009) demonstrated that the GLW sequences were similar or identical to those of the eastern wolf. Thus, it is disturbing that Kays *et al.* cite Wheeldon & White (2009) in the sentence preceding their use of the term GLW. In reporting on the same samples as Leonard & Wayne (2008), Koblmuller *et al.* (2009) did not recognize the GLW as a distinct species in their mtDNA phylogeny. This further demonstrates that the term GLW used to describe a phylogenetically distinct mtDNA lineage lacks support and consistency. Additionally, the failure on the part of Koblmuller *et al.* (2009) to distinguish between coyote and eastern wolf lineages obscures the view that western Great Lakes region wolves contain grey and eastern wolf genetic material, and thus are grey–eastern wolf hybrids (*C. lupus* × *lycaon*) and not wolf–coyote hybrids (Wheeldon 2009; Wheeldon & White 2009; Wilson *et al.* 2009). In addition to a more careful analysis of the probable colonization routes of western coyotes into northeastern North America, Kays *et al.* should have considered this alternative hypothesis,

which has considerable support in the literature (see Kyle *et al.* 2006).

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