

## Response

### Comment on “northeastern coyote/coywolf” taxonomy and admixture

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## Article

Recently, Way and Lynn (hereafter “the authors”; 2016) conducted a thorough literature review (or “meta-analysis” in their words, although no formal meta-analysis [*sensu* Arnqvist and Wooster 1995] was actually conducted) on the taxonomy and admixture of “northeastern coyotes/coywolves”. The authors commendably synthesised the available literature on this complex and controversial topic, demonstrating agreement among researchers that these canids occupy a unique ecological niche and are the product of hybridisation between coyotes *Canis latrans* and both grey wolves *C. lupus* and domestic dogs *C. l. familiaris*. Also, the authors suggested terminology, including both a common name and a scientific classification, and provided rationale. Herein, we discuss issues concerning terminology, provide additional context for interpreting the reviewed literature, and offer alternative recommendations for naming the canid under consideration.

The authors suggested that the most appropriate common name for the canid under consideration is “coywolf”, which they argue accounts for its two main genetic influences. Also, the authors stated that this canid has an intermediate body size, being larger than coyotes but smaller than wolves, and is statistically neither a coyote nor a wolf, but rather a hybrid of the two. This assessment is overly simplistic and belies the fact that this canid is genetically predominantly coyote (Monzón et al. 2014) and morphologically more similar to coyotes than wolves (Way 2013). Indeed, the authors themselves stated that “overall, and accounting for variability between studies, the northeastern coyote is [genetically] roughly 60% coyote, 30% wolf, and 10% domestic dog”; note that these approximate percentages were evidently not determined based on a meta-analysis of published genetic data. Furthermore, the authors’ notion that these canids “regularly” weigh  $\geq 20$ kg is dubious; in fact these canids typically weigh  $< 20$ kg across their range (Way 2013). Despite acknowledging domestic dog introgression/admixture, the authors suggested that the term “coywolf” still applies for the canid under consideration because domestic dogs are domesticated grey wolves. This argument is misguided, considering that domestic dogs and grey wolves, regardless of their past relationship, now clearly have different genetic, morphologic, and behavioural attributes, as well as different ecological roles (i.e. domestic dogs arguably have none). Thus, introgression/admixture from domestic dogs cannot be considered the evolutionary equivalent of that from grey wolves. Indeed, authors have acknowledged introgression/admixture from domestic dogs, separate from that of grey wolves, in the canid under consideration (vonHoldt et

al. 2011, Wheeldon et al. 2013, Monzón et al. 2014). Downplaying the significance of domestic dog introgression/admixture in this canid demonstrates a lack of foresight, because, although there is limited potential for ongoing introgression/admixture from other wild *Canis* across its range (due to limited sympatry), there is widespread potential for ongoing introgression/admixture from domestic dogs across its range.

A recent television documentary promulgated the term “coywolf” (Nature 2014), but most researchers interviewed therein specifically used the term “eastern coyote” rather than “coywolf”; the latter term was likely promoted by the producer(s) to garner media attention and viewership. Indeed, the authors confirmed that the term “eastern coyote” has been used most commonly in the scientific literature when referring to the canid under consideration. Notably, the term “coywolf” has not been used commonly in the scientific literature when referring to the canid under consideration except by the first author of the literature review in question, suggesting that it lacks general support in the scientific community. Specifically, other authors did not consider the term “coywolf” suitable for describing the canid under consideration, because its genetic composition is predominantly coyote (Chambers 2010) or because its mixed ancestry is more complex (Monzón et al. 2014). Thus, despite the authors’ rationale and employing portmanteau order, the term “coywolf” is misleading and incompletely summarises the mixed ancestry of the canid under consideration. Accordingly, it seems sensible to retain the familiar term “eastern coyote”, which denotes an animal that is predominantly coyote, generally in agreement with empirical evidence.

However, the authors suggested that “eastern coyote” is not an accurate term, noting that coyotes in the Northeast, mid-Atlantic region, and Southeast are considerably different from each other. Indeed, although coyotes in these three regions share the common attribute of wolf and/or domestic dog introgression/admixture (Adams et al. 2003, Kays et al. 2010, Bozarth et al. 2011, vonHoldt et al. 2011), which is notably absent in coyotes in western regions, available evidence indicates that such introgression/admixture has appreciably modified the phenotype of coyotes in the Northeast but not coyotes in the Southeast (Hilton 1978, Moore and Parker 1992, Adams et al. 2003, Kays et al. 2010); limited data exists on coyotes in the mid-Atlantic region, but phylogeographic analyses indicate multiple sources of colonisation (Bozarth et al. 2011). Regardless, the term “eastern coyote” was coined with respect to the coyotes that colonised the Northeast (Lawrence and Bossert 1969, Silver and Silver 1969), and was promulgated likewise

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(e.g. Hilton 1978), whereas no novel term was coined with respect to the coyotes that colonised the Southeast (Parker 1995). Accordingly, based on current understanding, coyotes in the Northeast are “eastern coyotes” whereas coyotes in the Southeast technically remain “western coyotes”.

The authors suggested that the canid under consideration be scientifically classified as *Canis oriens*, meaning “eastern canid”. Such classification would undoubtedly lead to further confusion, because the “eastern wolf” is technically an “eastern canid” but is scientifically classified as *Canis sp. cf. lycaon* (Committee on the Status of Endangered Wildlife in Canada 2015). The scientific classification *Canis latrans* var. seems most appropriate for the canid under consideration (i.e. “eastern coyote”), because this designation distinguishes it from *Canis latrans* (i.e. “western coyote”), acknowledges that it is a variety of coyote, and connotes variation (i.e. genetic and/or morphologic). The realm of *Canis* taxonomy is likely to remain controversial and confusing for some time, thus researchers should strive for clarity and consensus in nomenclature.

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## References

- Adams, J.R., Leonard, J.A. and Waits, L.P. 2003. Widespread occurrence of a domestic dog mitochondrial DNA haplotype in southeastern US coyotes. *Molecular Ecology* 12: 541–546.
- Arnqvist, G. and Wooster, D. 1995. Meta-analysis: synthesizing research findings in ecology and evolution. *Trends in Ecology and Evolution* 10: 236–240.
- Bozarth, C.A., Hailer, F., Rockwood, L.L., Edwards, C.W. and Maldonado, J.E. 2011. Coyote colonization of northern Virginia and admixture with Great Lakes wolves. *Journal of Mammalogy* 92: 1070–1080.
- Chambers, S.M. 2010. A perspective on the genetic composition of eastern coyotes. *Northeastern Naturalist* 17: 205–210.
- Committee on the Status of Endangered Wildlife in Canada. 2015. URL: [http://www.cosewic.gc.ca/eng/sct1/searchdetail\\_e.cfm?id=608](http://www.cosewic.gc.ca/eng/sct1/searchdetail_e.cfm?id=608). Accessed 30 March 2016.
- Hilton, H. 1978. Systematics and Ecology of the Eastern Coyote. Pp. 209–228 in M. Bekoff (ed.), *Coyotes: Biology, Behavior, and Management*. The Blackburn Press, Caldwell, NJ, USA.
- vonHoldt, B.M. et al. 2011. A genome-wide perspective on the evolutionary history of enigmatic wolf-like canids. *Genome Research* 21: 1294–1305.
- Kays, R., Curtis, A. and Kirchman, J.J. 2010. Rapid adaptive evolution of northeastern coyotes via hybridization with wolves. *Biology Letters* 6: 89–93.
- Lawrence, B. and Bossert, W. H. 1969. The cranial evidence for hybridization in New England *Canis*. *Brevoria* 330: 1–13.
- Monzón, J., Kays, R. and Dykhuizen, D.E. 2014. Assessment of coyote–dog admixture using ancestry-informative diagnostic SNPs. *Molecular Ecology* 23: 182–197.
- Moore, G.C. and Parker, G.R. 1992. Colonization by the Eastern Coyote (*Canis latrans*). Pp. 23–37 in A.H. Boer (ed.), *Ecology and Management of the Eastern Coyote*. Wildlife Research Unit, University of New Brunswick, Fredericton, NB, Canada.
- Nature. 2014. PBS Nature: Meet the Coywolf. URL: <http://www.pbs.org/wnet/nature/coywolf-meet-the-coywolf/>. Accessed 30 March 2016.
- Parker, G. 1995. *Eastern Coyote: The Story of Its Success*. Nimbus Publishing, Halifax, NS, Canada.
- Silver, H. and Silver, W.T. 1969. Growth and behavior of the coyote-like canid of northern New England with observations on canid hybrids. *Wildlife Monographs* 17: 3–41.
- Way, J.G. 2013. Taxonomic implications of morphological and genetic differences in northeastern coyotes (coywolves) (*Canis latrans* x *C. lycaon*), western coyotes (*C. latrans*), and eastern wolves (*C. lycaon* or *C. lupus lycaon*). *Canadian Field-Naturalist* 127: 1–16.
- Way, J.G. and Lynn, W.S. 2016. Northeastern coyote/coywolf taxonomy and admixture: A meta-analysis. *Canid Biology & Conservation* 19: 1–7. URL: [http://www.canids.org/CBC/20/comment\\_on\\_coyote\\_coywolf.pdf](http://www.canids.org/CBC/20/comment_on_coyote_coywolf.pdf).
- Wheeldon, T.J., Rutledge, L.Y., Patterson, B.R., White, B.N. and Wilson, P.J. 2013. Y-chromosome evidence supports asymmetric dog introgression into eastern coyotes. *Ecology and Evolution* 3: 3005–3020.

## Biographical sketch

**Tyler Wheeldon** has a B.S. (Carleton University) and M.S. (Trent University), the latter of which was related to the study of wolf-coyote hybridization in the western Great Lakes region of North America. He is currently pursuing a doctorate related to the study of eastern coyotes in southeastern Ontario.

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