

Conditions for Sexual Interactions Between Wild Grey Wolves, *Canis lupus*, and Coyotes, *Canis latrans*

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Thiel, Richard P. 2006. Conditions for sexual interactions between wild Grey Wolves, *Canis lupus*, and Coyotes, *Canis latrans*. Canadian Field-Naturalist 120(1): 27–30.

Genetic evidence for the hybridization of wild Grey Wolves and Coyotes was first reported by Lehmann et al (1991). Subsequent genetic and landscape-environmental analyses have attempted to grasp the extent of Wolf-Coyote crosses in North America. Since Wolves are normally territorial and thus aggressive towards Coyotes, hybridization events remain rare, not withstanding the taxonomic debates regarding *Canis* in eastern Ontario. In this paper I report on amicable interactions between Wolves and Coyotes observed in Wisconsin in recent decades and discuss circumstances that may lead to pairing between individuals of the two species.

Key Words: Grey Wolf, *Canis lupus*, Coyote, *Canis latrans*, interactions, hybridization, Wisconsin, Upper Great Lakes region.

Wolves and Coyotes can hybridize in captivity (Young and Goldman 1944; Silver and Silver 1969; Kolenosky 1971; Schmitz and Kolenosky 1985a, 1985b). Previously it was assumed that behavioral barriers prevented hybridization between *Canis* species (Wolf \times Coyote) in the wild. Evidence of such crosses in the wild remained elusive until Lehman et al. (1991) reported on the presence of Coyote genes in Wolf mitochondrial DNA material from the Upper Great Lakes region of North America probably from crosses between female Coyotes and male Wolves. This stimulated further investigations (Roy et al. 1994; Pilgrim et al. 1998; Boyd et al. 2001; Wayne et al. 1995; among others), confirming the introgression of Coyote genes in Wolf mtDNA in a region extending from the western Great Lakes east to Quebec.

Confounding these findings, recent DNA studies among *Canis* in eastern Ontario and northeastern United States hypothesize the existence of a unique and putative Eastern (Timber) Wolf (*Canis lycaon*) (Wilson et al. 2000, 2003) while other researchers argue the possibility that the Eastern Wolf is the Red Wolf (*Canis rufus*), or some type of a Wolf (*Canis lupus*) \times Coyote hybrid (Schmitz and Kolenosky 1985a; Wayne et al. 1995; Nowak 2003; Wayne and Vila 2003; Phillips et al. 2003; Sears et al. 2003; among others).

It is speculated that the tumultuous ecological upheavals caused by Eurasian settlement of North America disrupted *Canis* communities creating conditions facilitating hybridization (Wayne et al. 1995; among others). Forest fragmentation and heavy exploitation of *Canis* populations are believed responsible for current hybridization between various *Canis* communities in southeastern Ontario (Sears et al. 2003; Theberge and Theberge 2004).

The question remains under what environmental – behavioral circumstances did (do) unions between Coyotes and Wolves occur, given the usual aggressive

tendencies of Wolves to Coyotes? Lehman et al. (1991) believed that initial hybridization most likely occurred when young, male Wolves dispersed into an area with an endemic Coyote population where female Wolves were rare. I report encounters between Coyotes and Wolves in Wisconsin that support this theory during a period when Wolves were re-colonizing landscapes occupied by Coyotes. Because of the ongoing debate over *Canis* affinities in the east, I confine my comments to the Upper Great Lakes region of North America.

Methods

It is generally accepted that two taxonomically distinct wild canid species occur in Wisconsin: Grey Wolves (*Canis lupus*) and Coyotes (*Canis latrans*). Natural re-colonization of Wolves in Wisconsin began in the mid 1970s from expansion of the Minnesota population (Mech and Nowak 1981; Thiel and Welch 1981). Wolf monitoring has been conducted since 1979 in Wisconsin involving techniques that include a combination of winter track surveys, aerial surveillance of radio-collared Wolves, summer howl surveys, and collection of reports by government employees and citizens (Wydeven et al. 1995). The following cases of Wolf-Coyote interactions are derived from visual observations from both ground and aerial surveillance, and from interpretation of trails in snow.

Results

Florence County

Trails, raise-leg urinations (RLUs) and radio telemetry data indicated that three lone male Wolves occupied home ranges near one another in western Florence County (45°50'N, 88°50'W) in northeastern Wisconsin between 1982 and 1984. At that time 17 – 25 Wolves lived in 2-4 packs along the Minnesota-Wisconsin border (46°15'N, 92°00'W), and in two north-central Wisconsin packs, 150 km southeast of the border

area (45°30'N, 90°00'W). The Florence County Wolves were 100 km east of the two north-central packs. One of these Wolves, male 077, was captured and collared, and aerially radio-monitored about once-weekly for 250 days between 6 May 1983 and 11 January 1984, occupying a 44 km² home range.

Several citizen and US Forest Service reports involved sightings of a Coyote trailing a lone Wolf in the areas occupied by the lone male Wolves. Wolf Project personnel also observed snow sign indicating that lone Wolves and Coyotes interacted. On 17 February 1982, Wolf Project technician, Larry Prenn, and I followed the trail of a Coyote and Wolf over 3 km. We were not able to ascertain the timing of each canid's travel, but based on highly convoluted trail maneuvers, it appeared they were traveling together. The Wolf was likely a male (RLUing) and the Coyote was a female (squat urinations, including one with blood).

On 6 December 1983, while homing in on the signal of Wolf 077 using a Cessna 180 fixed-wing aircraft, pilot Dan Doberstein and I saw a pair of canids lying within 15- 20 m on the ice of Halsey Lake. One appeared 2 or 3 times larger than the other. After determining that neither was Wolf 077, we began a slow descent. When approximately 200 m above them, the smaller canid stood up and quickly ran off into thick lowland conifer cover. We identified it as a Coyote. As it disappeared into cover, a third, larger canid ran from shore to where the second canid was still lying. On our third pass we approached within 10 m of these canids; the second one was larger, and we agreed they were both Wolves. Shortly thereafter we located Wolf 077 male 9.6 km to the east.

The following morning we attempted to inspect their trails, but high winds overnight and thin ice made interpretation challenging. We found outlines of two large tracks corresponding in size to Wolf, and one small Coyote-sized track. No evidence of a kill-site was found that might have attracted the two species.

Wood County

In each of seven winters between 1995 and 2002 high school students under my supervision followed the snow trails of a non-collared male Wolf, 501 that had escaped into the 36 km² Sandhill Wildlife Area (SWA) in Wood County (44°17'N, 90°10'W) (Thiel 2000; Thiel unpublished data) in May 1995. This is a deer research facility enclosed by 3 m tall × 29.5 km long fence. At that time, Wolves were colonizing this portion of west-central Wisconsin. In winter, 1996-1997, a territorial pair of Wolves colonized the area surrounding SWA. In January 1998, a pair of Wolves believed to be yearling siblings, entered SWA, and subsequent snowfall prevented them from digging out beneath the fence and leaving. Wolf 501 paired with one of these Wolves, a female based on bloody urine discovered on 20 January 1998. The third Wolf thereafter roamed the area as a loner.

In March a 6.5 year-old radioed Coyote was killed by Wolves within SWA. Likely, Wolf 501 male was involved in its death. Wolf 501 was last observed with another Wolf in October 1998. In four additional winters of snow tracking, Wolf 501 was the only Wolf detected within SWA.

On 22 January 2001, High School students reported trailing Wolf 501 male and encountered where the Wolf had physically interacted with a Coyote, resulting in an injury to the Wolf's right front foot. On 5 February several students and I encountered Wolf 501 male's trail where it intersected a Coyote's trail, heading in the same direction. In backtracking we determined the Coyote was a proestrus female based on bloody urine.

The mutual trail led to a 5 m × 5 m site completely padded down with Wolf and Coyote tracks. Numerous small droplets of blood and several tufts of canid fur were found in the padded-down site. Genetic testing to ascertain the species leaving the blood and fur was cost-prohibitive. By carefully back-trailing and following the tracks of both the Coyote and Wolf 501 male as they left the site we established the Wolf had been injured by the proestrus Coyote at the padded down site.

The Coyote and Wolf walked on the same trail for approximately 1 km beyond the padded down site before separating. Bloody Coyote urine was noted three times along this trail, and the Wolf inspected each. At one spot along the trail the Coyote and Wolf sat down within 1.5 m of each other. We followed the Wolf an additional 3.2 km after their trails separated. The Wolf RLU'd 8 times, and in each of five beds we found the imprint of his bloody limb.

It was evident that both canids were present together and spent considerable time at the padded down site. Since we found no evidence of prey remains, and since Wolf 501 male did not react aggressively when injured by the proestrus Coyote we concluded that his injury was caused by unwanted sexual advances.

At approximately 0830 (CDT) on 22 June 2001, amateur wildlife photographer, Rudi Van Stedum, saw male Wolf 501 male standing on rock talus in a forest in SWA at a distance of approximately 50 m. The Wolf was watching her as she idled her car along a woods trail. Simultaneously Van Stedum saw movement obliquely behind and left of the Wolf. A Coyote approached but retreated when it became aware of her car. Meanwhile, the Wolf turned and left the rock, facing her. At that point, the Coyote again approached the Wolf from behind and thrust its muzzle forcefully into the left rump of the Wolf. A yelp from the Wolf was clearly audible while the Wolf's gaze remained fixed on Van Stedum. The Coyote stepped back, and both stood still for a moment before the Wolf walked a ways off and turned momentarily to look at her. As the Wolf began slowly walking away, the Coyote approached it from behind and jabbed it a second time in its left hip with its muzzle. The Wolf yelped again. Both then trailed off into the undergrowth.

Wildlife biologist Wayne Hall and I inspected Van Stedum's photographs, and while they were taken in poor light conditions and no single frame showed both the Wolf and Coyote, the position of trees in the background of all photographs attested to the accuracy of her observation. Wolf 501 male roamed SWA alone in winter 2001-2002 and disappeared sometime after October 2002. No evidence of hybrids materialized subsequent to the observations in 2001.

Discussion

Coyote mtDNA in Wolves was calculated as the result of six hybridization episodes between male Wolves and female Coyotes (Lehman et al. 1991); Wayne and Vila (2003) speculated that, "... female wolves and male coyotes are more closely matched in size, and thus may also be more likely to mate...", but they further noted that no Coyotes sampled had Wolf-like haplotypes.

Several researchers have speculated that male Wolf dispersers provide the potential pool for male Wolf \times female Coyote unions (Lehman et al. 1991; Wayne and Vila 2003; among others). While probably true, this is not necessarily because male Wolves disperse beyond the edge of Wolf range, as is implied. During winter 1983-1984, Michigan and Wisconsin DNR biologists discovered several lone male Wolves living in a several thousand square kilometer area. Some of these Wolves, like Wolf 077, seemed to have home ranges, as evidenced by RLU'ing (R. Thiel and J. Hammill, unpublished notes). They likely originated from at least 100 km away where the nearest known packs then existed. But female Wolves also dispersed to this area. In summer-fall 1986 radio-collared female Wolf 035 dispersed from Douglas County, Wisconsin (46°15'N, 92°00'W) 277 km to Iron County, Michigan (46°20'N, 88°59'W) and settled into a 174 km² home range, becoming the first known Wolf to reach upper Michigan since their demise in the late 1950s (Thiel 1988). The first breeding Wolf pack in upper Michigan would establish itself within this same area in 1990-1991 (J. Hammill, personal communication, 1 March 2004), implying that other female Wolves also dispersed to this region. The male Wolf \times female Coyote hybridization hypothesis is therefore not explained in our region by any superior dispersal advantage displayed by male Wolves.

Because of their size, Wolves can easily overpower and kill Coyotes. Ballard et al. (2003: page 267, Table 10.4) summarized Wolf-Coyote interactions in Yellowstone National Park and noted that 11 percent of interactions resulted in killed Coyotes. In fatal encounters, the number of Wolves exceeded the number of Coyotes. Wisconsin biologists have also encountered aggressive interactions between Wolves and Coyotes, including killings of Coyotes. Killings involved superior numbers of Wolves (R. Thiel, unpublished data). In contrast, the few observations of single Wolf and Coyote encounters are not known to have resulted in

killings. In the fall of 1981 pilot Jim Dienstl and I watched dispersing lone male Wolf 023 chase a Coyote from a White-tailed Deer (*Odocoileus virginianus*) fawn kill, but made no attempt to catch or kill it. SWA male Wolf 501 likely killed at least one Coyote when paired with a female Wolf. Four years later, this same male Wolf - who remained a loner in those four years - consorted with one or more Coyotes on at least three occasions; one case involving a proestrus female Coyote.

As in the Wisconsin cases reported here, Michigan DNR biologist, J. Hammill (personal communication, 1 March 2004), witnessed two separate incidents where a single Wolf and Coyote apparently traveled and bedded down together during the early years of Wolf recolonization.

Within Wolf range, owing to the aggressive stance pack Wolves normally display towards foreign Wolves and Coyotes (Arjo and Pletscher 1999; Ballard et al. 2003), hybridization events must be exceedingly rare. Observations reported here indicate that single Wolves are capable of genial behavioral interactions with Coyotes. Further, they suggest a potential for sexual advances of male Wolves towards female Coyotes, when and where male Wolves lack access to female Wolves. Unions between male Wolves and female Coyotes probably remain localized (however, note Schmitz and Kolenosky 1985a; Sears et al. 2003; and Theberge and Theberge 2004), and likely occur in areas of exceedingly low Wolf densities where access to female Coyotes by single male Wolves far exceeds access to female Wolves. Under such circumstances, hybridization is at least possible, and then depends on the behavioral nuances of these canids as individuals.

Acknowledgments

I thank L. D. Mech, United States Geological Survey, and A. Wydeven, Wisconsin DNR, for comments on an earlier draft of this manuscript.

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Received 22 March 2004

Accepted 7 November 2005