

Notes

Double-litters in Coywolf, *Canis latrans* × *lycaon*, Packs Following the Death or Disappearance of a Resident Territorial Male

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Previous research on my Cape Cod, Massachusetts study site documented the killing of a breeding male Coywolf (*Canis latrans* × *lycaon*; also called Eastern Coyote) and a subsequent increase in local pack density one year later. This study documents double-litters produced in two packs following the death or disappearance of the original breeding male.

Key Words: Coywolf, Eastern Coyote, *Canis latrans* × *lycaon*, breeding male, double litter, multiple litters, reproduction.

Previous research showed that the death of a breeding male Coywolf (*Canis latrans* × *lycaon*; also called Eastern Coyote: Way et al. 2010) caused a doubling of pack density, likely due to the lack of that male guarding the original territory and a subsequent influx of young animals into that territory (Way et al. 2009). Here, I report instances of multiple females producing litters (hereafter double-litter) within the same territory when the original breeding male died or disappeared on Cape Cod, Massachusetts. While other studies have documented double-litters in Coyotes (*Canis latrans*) and Wolves (*Canis lupus*) (Way et al. 2001; Mech and Boitani 2003; and sources within both), this study is unique because it provides evidence that they happened directly after the turnover of resident breeding males.

During 1999–2000, a 13.4 kg radio-collared female Coywolf (ID #9902) was tracked and regularly observed with an uncollared but recognizable mate (based on physical characteristics: robust build, light grayish-brown coat with thin white shoulder stripes). Their rendezvous site (see Way et al. 2001) during June 2000 was on a golf course where I often (5 days a week) observed the pair, 2–3 full-grown (probable) yearling helpers, and 5–6 pups of the year (10 total). During these observations, a 21.5 kg transient radio-collared male (#0001) spent much time in and at the edge of 9902's (Hyannisport Pack) territory. Field work was not conducted from late June 2000 until early January 2001 but when research on this pack resumed, 9902's mate had disappeared and 0001 was paired with 9902. That spring (2001), 0001 tended two dens 2.8 km apart within the pack's territory: 9902's and likely one of her daughters (Way et al. 2001). Five pups were determined by residents and the author (and 0001 was sighted 5 times and often

radio-located) at the auxiliary den and I observed ≥2–3 newborn pups with 9902 in a den mid-March that 0001 also attended. Coywolf 9902 tended these pups separately from the auxiliary den until late summer 2001 when she was displaced from the territory, likely by that daughter. She left the territory and was ultimately shot ca. 10 km away in November 2002. Coywolf 0001 was hit and killed by a car on 20 August 2001 and radio-contact with this pack was lost. The fates of both litters were unknown following the disappearance of 9902 and death of 0001 in summer 2001. However, a ~6 year old, 18 kg lactating female (#0606) was captured in this area and radio-tracked from June 2006 – February 2008 until either her collar died or she left the study area. This gray animal looked exactly like 9902's daughter from 2001 (J. Way, unpublished data), was of the appropriate age, and genetics confirmed that she was one of 9902's offspring (Way et al. 2010, B. White, Trent University, unpublished data). It is possible that 0606 was able to displace her mother in 2001 because of her larger body size and the likelihood that neither was related to 0001.

In a second scenario, a 17.3 kg radio-collared breeding male Coywolf (#0601) was captured March 2006. He and his uncollared mate had ≥3–4 pups that I directly observed during summer 2006. One of their 7-month old daughters (14.6 kg, #0608) was captured 11 November 2006 and tracked with 0601 until December 2006 when he was shot and killed. Subsequently, 0608 never dispersed from her natal range. She acted as a helper in 2007 to an observed five pups of her putative mother whom I identified based on physical characteristics and behavior when 0601 was alive: she was dominant over 0608 but neutral and paired with 0601. In addition, in 2007 I observed

a new tall, brown uncollared adult breeding male. In 2007-2008, I observed ($n = 4$) 0608 scent-marking portions of the original territory with one or two other individuals (three observations included that new male) and gave birth in April 2008 to a litter while a second Coywolf believed to be her mother was observed lactating and interacting with 0608 within the core of that territory. I never was able to directly determine a pup count of either litter that summer but was certain that 0608 had pups ($\geq 3-4$) based on: (1) vocalizations (e.g., whimpering, whining) that I heard in mid-May in a swamp on the Fairgrounds Golf Course in Marstons Mills, (2) visual observations ($n = 8$) of her lactating in spring and early summer 2008, and (3) her four week localization in the Fairgrounds swamp. In May and June 2008, I also heard pups howling from the area where 0608 was born in 2006 (determined by repeated locations of 0601 at that site from April - May 2006) at the North-east edge of Mystic Lake. This den was 1.2 km away from 0608's golf course den and both were in the core of 0608's (and formerly 0601's) territory. In addition, I observed 0608's putative mother crossing a main road (Race Lane) three times in April - May 2008 traveling back to the Mystic Lake probable den site. The study ended in early March 2009 when 0608 suspiciously disappeared; her collar was found in late-October 2009 at a residence ca. 5 km to the west.

Unfortunately less was known about the circumstances of these double-litter events than the detail reported in Way et al. (2009), mainly because fewer animals were concurrently radio-collared in these packs. Ultimately, I never made a maximal direct count of both of the double-litters in both packs. But based on available data provided herein, both new males (0001 and tall, brown adult) in the respective packs appeared to have mated with two females in each territory. There is the potential that another male mated ≥ 1 of the females in each pack (e.g., I observed an uncollared distinct looking white-faced, tan male that traveled alone within 0608's territory [≥ 4 residents in the pack] in February 2008) but the point of this paper is to document double litters following the disappearance of the original male and that possibility would not distract from the findings

herein. And the fact that the new males were not resident in those territories until the original males disappeared raises the possibility that the disappearance of the original breeding males allowed the unrelated males to join the resident pack and breed more than one female because they both were probably not related to either female in the respective packs. Circumstances prevented my verifying litter survival in these packs, increase in density of either pack, increase in transients (i.e., dispersal of the pups), or decrease in territory size (Way et al. 2009), which distracts from these findings. However, I did document four adults/yearlings (i.e., a normal pack size) in both groups during winter. Therefore, the possibility remains that most pups in the double litters died or dispersed in their first autumn.

Despite not documenting litter survival or increase in local Coywolf density, it is nonetheless noteworthy that two double-litters were documented following the turnover of breeding males. This indicates the potential for densities of Coyotes/Coywolves to increase following loss of breeding males (Way et al. 2009).

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