Record Pack-density of Eastern Coyotes/Coywolves (Canis latrans × lycaon)

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Notes and Discussion

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ABSTRACT.—We report on an eastern coyote or coywolf (*Canis latrans* × *lycaon*) pack in a heavily urbanized area at the northern edge of Boston, Massachusetts, living at a high pack density. We radio-collared four members of this social unit, a breeding pair and two of their juvenile offspring and tracked them from May 2004–Apr. 2005. The pack had a small cumulative territory area (overall = 2.05 km^2), yet lived at a normal group size (fall = 6–7, winter = 4) for coyotes/coywolves in eastern North America. Fall density for this pack was 2.92–3.41/km^2 and winter density was 1.95/km^2, representing the highest recorded density for coyotes in this region.

INTRODUCTION

The eastern coyote or coywolf (*Canis latrans* × *lycaon*; hereafter coyote for consistency purposes) is a unique form of canid that is large (ca. 15–18 kg - see Way, 2007a), genetically distinct (Way *et al.*, 2010), lives at relatively low densities (ca. 3.0–4.0 individuals per 30 km^2), and has comparably large territory sizes compared to the western coyote (Andelt, 1985; Harrison, 1992; Parker, 1995; Patterson and Messier, 2001; Way *et al.*, 2002a; Way, 2003). Coyotes in the western portion of their geographic range typically occur at higher densities with an average of ~1 and a maximum of 3.0 individuals per km^2 primarily in the southern half of the United States (*see* Andelt, 1985; Gier, 1975; Parker, 1995: Chapter 6). However, Parker (1995) estimates that average coyote densities in northeastern North America are only around 0.10–0.20 coyotes per km^2, similar to findings by Way *et al.* (2002a) in Massachusetts who reported 0.07–0.15 individuals per km^2 on suburban Cape Cod, Massachusetts. The record reported coyote density found in northeastern North America was 0.57 per km^2 in Maine in the winter (Hilton, 1986). Understanding the range in reported densities of a territorial species like the coyote throughout its range is important because this directly influences population dynamics in an area. Herein we report on a single eastern coyote pack that existed at a record density for 10 mo as the result of a small territory area.

METHODS

Research was conducted in a relatively undeveloped patch of cemetery/woodland surrounded by dense suburban development in the bordering towns of Everett (4345 people/km^2), Malden (4291 people/km^2), and Revere (3089 people/km^2; U.S. Census Bureau, 2000 estimates) on the north edge of Boston, Massachusetts. The nearest green area (*i.e.*, Rumney Marsh, a large estuary) was located 2 km east of the northeastern edge of their territory and involved crossing a highly developed area as well as a four-lane highway (Rte. 1).

Eastern coyotes were captured using box traps (Way *et al.*, 2002b) and a ground-based netlauncher (Coda Enterprises, Mesa, Arizona, USA) and given radio-collars for monitoring purposes. Portable receivers (Custom Electronics, Urbana, Illinois, USA) and hand-held three-element Yagi antennas were used to radio-track individuals from a vehicle (*see* Way *et al.*, 2004). Due to the abundance of roads we homed in on the animal's signal until its location was pinpointed by using the loudest signal technique (Springer, 1979). Radio-collared animals were tracked throughout a 24 h time period to ensure accurate representation of activity and movement with radio-locations taken 6–7 d/wk with 2–3 night tracking sessions/wk consisting of 10–20 locations (≥15 min apart) per each 4–6 h radio-tracking bout.

Collared coyotes were seen with untagged companion(s) (*e.g.,* Way, 2003). A detailed description (*e.g.,* size, coloration, distinguishing markings and behavior) of the uncollared animals was made during every visual observation to identify as many individuals as possible from this study pack. The greatest number of individuals observed during a night-time tracking session was considered the pack size for each season, which approximates Mech and Tracy's (2004) aerial observations of counting all the wolves in the pack at the same time. We often did not see all of the coyotes together because of our limited view from a vehicle (often at night); instead we managed to see them in separate groups (ranging from one to six individuals) within the same night, often in close proximity (<100 m).

To estimate territory size, we utilized the Home Range Tools extension for ArcGIS, Version 9.2 (Rodgers *et al.*, 2007). Each coyote's home range was calculated using the 95% Minimum Convex Polygon (MCP) methods. Density was estimated based on observed territory size and pack size for both fall (pre-dispersal) and late-winter (post-pup-dispersal).

RESULTS

From 17 May 2004–3 Apr. 2005 we monitored the Cemetery Pack. Four individuals were captured and radio-collared in this social unit: (1) a 14.5 kg lactating female breeding female (ID ''Maeve'') captured 17 May 2004, (2) a 15.9 kg breeding male (''Jet'') captured 29 Jun. 2004, (3) a 10.0 kg 4.5 mo old female pup (''Jem'') captured on 26 Aug. 2004 and (4) a 12.3 kg 5 mo old male pup (''Cour'') captured on 15 Sept. 2004. The genetic relatedness of the four radio-collared individuals was confirmed by Dr. Bradley White's DNA lab at Trent University (Way *et al.*, 2010). In addition, two uncollared pups were individually identified starting in late-summer 2004; one of these pups delayed dispersal to remain with the family unit through the study period. We also observed a light gray adult four times from late-summer 2004 to Oct. 2004. This individual was either located with the pups or near an adult when sighted.

We located the four radio-collared individuals in the pack a cumulative total of 1587 times (range: 181–562 per individual) and located them each 100% of attempted radio-fixes on 122 tracking events. The pack resided almost exclusively in a green area (>90% of home range, including some thicker woods surrounding the cemeteries) surrounding four large connected cemeteries. Their combined 95% MCP home range size was 2.05 km^2, ranging from 1.18 (collared female pup up until her Dec. dispersal) to 2.11 km^2 (breeding male). The density of this pack was estimated to be 2.93–3.41 individuals per km^2 prior to dispersal (*i.e.*, late-fall/early winter) when six or seven (including the uncollared adult gray) coyotes lived on the territory and 1.95/km^2 through late-winter when four (three being collared) lived on the territory. Monitoring of this group ended 3 Apr. 2005 after the last of the three radio-collared pack members died after ingesting poison (Way *et al.*, 2006).

DISCUSSION

The pack density (fall density = 2.93–3.41 individuals per km^2 and winter density = 1.95 individuals per km^2) easily exceeds the previous record density reported for the coyote in eastern North America (Hilton, 1986) and is on par with the highest recorded density of ~3 individuals per km^2 across their range (Andelt, 1985; Gier, 1975; Parker, 1995: Chapter 6). In order for the local density of a territorial species such as a wolf (*Canis lupus*) or coyote to increase, at least one of the following scenarios must occur: (1) average pack territory decreases in an area (*e.g.,* Person and Hirth [1991] in suburban portions of their study area), (2) average group/pack size increases (*e.g.,* Mech and Boitani, 2003; Way, 2003) or (3) packs become less territorial and allow for overlap among territories (Mech and Boitani, 2003: 24–25). Our study pack lived at a typical winter pack size of four eastern coyotes (Patterson and Messier, 2001; Way *et al.*, 2002a) but lived in a small territory area (*i.e.*, scenario #1).

In addition to the two collared adults and four pups (two of which were collared), we decided to also include the uncollared gray adult in the density estimate because it was observed with the pups which is consistent with helping behavior in coyotes (*see* Way *et al.*, 2002a; Way, 2003). However, due to the infrequent observations of this individual, there remains the possibility it was a floating transient/nomad (*see* Way, 2007b) that occupied a larger area than the rest of the pack yet occasionally returned to this site. Under this scenario, it should be excluded from the pack's density estimate.

This study illustrates that coyotes/coywolves in eastern North America can live at high densities under certain situations. However, this study only involved the territory of one pack and caution should be heeded to avoid extrapolating to larger spatial scales when inferring population estimates until additional evidence is found to support these observations involving multiple packs.

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