

Eastern Coyotes, *Canis latrans*, Observed Feeding on Periodical Cicadas, *Magicicada septendecim*

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Eastern Coyotes (*Canis latrans*) were observed feeding on Periodical Cicadas (*Magicicada septendecim*) during their once every 17 year emergence (for three weeks) in June 2008.

Key Words: Eastern Coyote, *Canis latrans*, Periodical Cicada, *Magicicada septendecim*, predation, Massachusetts.

Coyotes (*Canis latrans*) eat a variety of prey including fruits/berries, small mammals, deer (*Odocoileus* spp.), phocids, and livestock (see Harrison and Harrison 1984; Andelt 1985; Parker 1995; Gese et al. 1996; Sacks et al. 1999; Patterson and Messier 2000; Way and Horton 2004), and feed mostly on medium to large-sized prey in northeastern North America (see Parker 1995 for a review). There is little known on the importance of insects in Coyote diets except that they appear in scats (especially seasonally) but usually in non-significant amounts, especially in terms of biomass (Nellis and Keith 1976; Litvaitis and Shaw 1980; Andelt 1985; Cypher 1993). Cypher et al. (1994), quoting Cypher (1991), noted that Coyotes consumed 13-year Cicadas (*Magicicada tredecassini*) when in abundance, indicating that insects can be an important food source when abundant. This might not be surprising, however, given that insects contribute significantly to the diets of smaller canids, such as the many species of foxes, including Bat-eared Foxes (*Otocyon megalotis*) in Africa (see Macdonald and Sillero-Zubiri 2004) and Red Foxes (*Vulpes vulpes*) in Canada (Henry 1986: 64-66). Although Eastern Coyotes are bigger than all species of foxes, it is probable that Coyotes also use insects as an important food source either seasonally or when abundant. As part of a long-term ecological study on Cape Cod, Massachusetts (Way et al. 2001, 2002, 2004; Way 2007), Eastern Coyotes were opportunistically observed foraging for Periodical Cicadas (*Magicicada septendecim*; Brood XIV, Bunker 2008*) and Cicada remains were found inside fresh scat.

I observed Cicadas first emerging during a 3-day heat wave (~32°C) starting on 8 June 2008. A couple of days later they were extremely loud in fragmented patches within my study area, within the town of Barnstable, Massachusetts (J. Way, unpublished data).

On 18 June 2008, I observed radio-collared Coyote #0801 (Way 2008a*, b*) at 0154 h under a street light on Concord Street in the village of Osterville. He walked onto the neighborhood road between two houses. On the front lawn of one of those houses he walked, sniffed, and bit at something on the ground,

then chewed it up. He did this 6 – 7 times in the 1 – 1.5 min that I observed him under the street light. This area was very close (<100 m) to a powerline right of way, a known hot spot of Cicada activity (J. Way, unpublished data). The chewing that I heard from #0801 sounded like the cracked bodies of the Cicada's exoskeletons. I monitored the Coyote until 0205. He was out of sight but his signal indicated that he was foraging in the same neighborhood, possibly on Cicadas.

On 19 June 2008, Coyote 0801 and his group (consisting of at least two or three pups and his uncollared mate) moved their rendezvous site (Way et al. 2001) > 1 km to the powerline corridor mentioned above, but > 1 km west of the 18 June sighting. On 21 June 2008, I walked the powerlines from 0542 – 0605 h and saw two pups foraging under the powerlines, around sapling trees (powerline vegetation was cleared ~5 yr before). They were doing considerable amounts of sniffing and biting at plants and I could see Cicadas jumping around them. Judging from that observation, I had no doubt that they had already learned to (and/or were taught how to) hunt for Cicadas.

During that same time frame (mid-June 2008) I also found two Coyote scats in Coyote 0801's territory that were completely full of Cicada exoskeletons. I suspect that I would have found more if I had looked more thoroughly but other field priorities at the time prevented that.

Finally, circumstantial evidence of a long-time radio-collared female Coyote (#0204; tracked from 2002 – 2008) during June 2008 indicated that her pack (two or three other adults and an unknown number of pups) may have situated their pups near a concentration of Cicadas. Her pack resided to the immediate east of 0801's pack. In my conversations with local landscapers, that area contained "an amazing number of Cicadas", where, in fact, they were so abundant the landscapers sometimes could not even mow their clients' lawns. I managed to observe #0204 in that immediate residential area (1 km from where her pups were moved to) but did not make any extensive observations partly due to the lack of streetlights in the area to observe her at night. However, her group's sudden

shift to that portion of their territory about 4 km from where she gave birth is noteworthy.

The Cicadas quieted down in early July 2008 and Coyotes resumed their normal foraging habits of traveling many kilometers per night in search of prey within their territories (Way et al. 2004). Coyote use of a periodically abundant (once every 17 years for about 3 weeks) food supply such as Cicadas might not come as a surprise, given their famous adaptability and catholic feeding habits (see Parker 1995 and sources within). Similarly, Grizzly Bears (*Ursus arctos horribilis*) feed heavily on Army Cutworm Moths (*Euxoa auxiliaris*) when seasonally abundant and gain many calories from those insects (White et al. 1998). However, it is noteworthy that Eastern Coyotes quickly learned to use this novel and rarely found food source that had not been available in that area since 1991.

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Precision of Description of White-tailed Deer, *Odocoileus virginianus*

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Based on 168 records of both sexes, the percentage of fat measured laterally in the marrow of the femur was significantly greater than the percentage of fat measured laterally in the marrow of the humerus (56% vs. 43%).

Key Words: White-tailed Deer, *Odocoileus virginianus*, fat, marrow.

Marrow-fat content has been used as a measure of nutritional condition, especially in the context of the fat condition score (FCS; Schumacher 1949). Although marrow fat content is a one-way test capable of indicating poor condition but not necessarily good condition (Mech and DelGiudice 2001), it is a method of measuring marrow fat content that is not as precise as the method of measuring marrow fat content from the femur (Mech 2008). The dry weight of the marrow indicates the percentage of fat in the marrow.

However, it is not always clear how to weigh bone marrow. For example, some researchers use a dead animal unprepared for dissection (Mech and DelGiudice 2001). Others use a description of the marrow, usually by weighing the marrow, to indicate the relation between these descriptions and the actual fat content, however, has not been used.

Volunteer technicians described the fat of White-tailed Deer (*Odocoileus virginianus*) and measured the fat content (FCS) of the marrow. I measured the correlation between the FCS and the actual fat measurement. I measured the fat content of the marrow of 168 Deer killed by Wolves (*Canis lupus*) in the White-tailed Deer eastern Minnesota from 1991 to 1999. The technicians were involved, and the marrow from 168 Deer. Descriptions of the marrow on a form and included "pale," "waxy," "greasy," and "gelatinous."

I sorted the data file by FCS and found that the only description of marrow that was reasonably well correlated with the actual fat content were "gelatinous" in 15 (5%) of the marrow, and only 5 (4%) of 135