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Territorial Marking by Lone Male Gray Wolves, *Canis lupus*

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We documented three separate instances in which alpha male Gray Wolves (*Canis lupus*) scent marked and remained in their original pack's territory after all the other members of the original pack were gone due to death or dispersal. They continued to scent mark until they attracted another mate to the territory and began a new pack.

Key Words: Gray Wolf, *Canis lupus*, pack, alpha, sent marking, lone, territory, Two Toes, RLUs.

Most previous literature on the behavior of solitary Gray Wolves has focused on single yearling or adult females remaining in their original pack territory to attract a new mate (Ballard et al. 1987), and dispersing offspring of alpha pairs (Mech 1973; Van Ballenberghe 1983; Messier 1985; Gese and Mech 1991) with occasional mention of "peripheral" wolves that inhabit the edges of pack territories (Mech 1970). It was often assumed that solitary male wolves do not maintain territories by scent marking, but disperse and attempt to colonize vacant habitat or join existing packs (Ballard et al. 1987). Implicit in this assumption is that alpha males left alone will not maintain and scent mark territories previously occupied and maintained by their entire pack (Rothman and Mech 1979: 753).

Three adult male wolves from three different packs were monitored from 1991–1995, in north central Wisconsin. Two of the males, M128 and M201, and several of their pack members were radio-collared and located by aerial or ground surveillance once or twice a week. Aerial telemetry was used to delineate territories (determined by > 35 winter and > 25 summer locations (Fuller and Snow 1988)) using minimum area polygon criteria (Mohr 1947). Visual observations, winter snow track surveys (Thiel 1978; Thiel and Welch 1981) and summer howling surveys (Harrington and Mech 1982) were used to determine whether wolves were alone or with other pack members. During winter tracking, raised leg urinations (RLUs) were used to determine the presence of an alpha wolf, and double RLUs (with estrus blood) were used to determine the presence of a breeding pair (Peters and Mech 1975; Rothman and Mech 1979).

M128, an adult male of the Bootjack Lake Pack, was captured and collared on 23 July 1991. Sixty-six aerial-radio locations of an adult female (F099) had been used to delineate the territory inhabited by this pack during 1987–1988. There was evidence that M128 inhabited the area with other pack members immediately prior to his capture. Two wolves responded to howling on 13 and 18 July 1991, and previous winter tracking surveys (1990–91) indicated there had been three wolves. Data obtained from 52 aerial locations, four howling surveys, three sightings and two snow tracking surveys indicated that wolf M128 remained alone in his territory from the time of capture until 3 February 1992. Two RLUs found on a winter track survey on 6 January 1992 indicated he continued to scent mark his territory without a mate or other pack members. Wolf M128 was first seen with another wolf on 3 February 1992. The next day tracks of two animals (one being M128) and double RLUs with estrus blood were found, indicating that M128 had been joined by an adult female. He was seen on 17 subsequent aerial locations with one or more wolves during 6 February 1992–12 April 1993.

Our second case of a lone wolf scent marking and maintaining a territory involved wolf M201, an adult male from the Little Rice River Pack. M201 was captured and radio collared 23 October 1991. From capture until 31 August 1993, he occupied a territory with one or more pack members, based on aerial observations, track surveys, and the presence of RLUs with estrus blood. From 1 September 1993 until 12 March 1995, M201 was alone and remained within his territory based on 71 telemetry locations. During this period, wolf M201 continued to scent mark. M201 was snow tracked a total of 5.8 km, on 24 February 1994, and 31 January 1995. We found no tracks of other wolves but RLUs were found in three different locations on these track surveys. Six aerial observations also indicated he was alone. Three RLUs, one with estrus blood, were observed on 12 March 1995 while we were following tracks of two wolves (one being M201) for 1.9 km in M201's territory. This was the first evidence of a second wolf since 1 September 1993.

Our third case involved an un-collared male wolf nicknamed Two Toes. He was missing the center two toes on one front foot, making his tracks easy to identify. Two Toes appeared to be the alpha male of the Ranger Island Pack in January 1992. Two wolves, one of which was missing two toes, was tracked a total of 4.8 km in that territory on 14 January and 31 March 1992. Evidence of three RLUs, with two containing estrus blood, indicated a breeding pair in this pack. No wolf tracks other than those of Two Toes were found on track surveys conducted on 8 December 1993, 22 January 1994, and 17 February 1994. We found six RLUs on snow banks along four different gravel roads in the Ranger Islands Pack's territory. Two of the RLUs were deposited on snow clumps located at road intersections normally scent marked by this pack. This indicated he continued to mark his territory while alone. Tracks of two wolves one of which was missing two toes, were followed 6.7 km on 1 January 1995 in the southwest corner of the Ranger Island Pack's territory. It appeared that "Two Toes" may have found a new mate after > 2 years of maintaining this territory alone.

The three males mentioned here scent marked an average of 0.4 RLUs per km on main roads while alone in their territories. This was less than when they were with mates or other pack members (0.7 RLUs per km). It seems that maintaining a territory after the death or dispersal of all other pack members is a viable option for some lone male wolves (Rothman and Mech 1979) and apparently lone female wolves (Ballerd et al. 1987). It could be assumed that when a suitable territory is established, the best strategy may be to scent mark this territory and wait for a mate, instead of venturing out in unfamiliar territory to find one.

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Estimating the Weight of Wolves, *Canis lupus*, from Chest Girth Measurements

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Regression equations relating weight with chest girth have been reported for a variety of wildlife species, but not Wolves (*Canis lupus*). We recorded the weights and chest girths of 114 Wolves taken in central and northern Minnesota between 1995 and 1997. Regression equations were developed for the estimation of Wolf weight from chest girth. A significant correlation existed between body weight and chest girth ($r^2 = 0.815$, $n = 114$, $P < 0.001$). There was no significant difference between regression equations when grouped by sex.

Key Words: Wolf, *Canis lupus*, chest girth, Minnesota.

Because weights are indicators of physical condition (Kirkpatrick 1980) they are useful in research and management of wildlife species and are often obtained from harvested Wolves (*Canis lupus*), or those captured for research purposes.

Several studies have demonstrated that weights can be accurately predicted from chest girth measurements of a variety of mammals. Payne (1976) developed an equation that would predict the weight of Black Bears (*Ursus americanus*) within about 95 percent of the true value for Newfoundland. Likewise, relationships between weight and chest girth have been established for Caribou (*Rangifer tarandus*), (McEwan and Wood 1966), White-tailed Deer (*Odocoileus virginianus*) (Urbston et al. 1976), Bison (*Bison bison*) (Kelsall et al. 1978), Mountain Goats (*Oreamnos americanus*) (Rideout and Worthen 1975), Grizzly Bears (*Ursus arctos*) (Nagy et al. 1984), Polar Bears (*Ursus maritimus*) (Kolenosky et al. 1989), Elk (*Cervus elaphus*) (Millspaugh and Brundige 1996) as well as several East African mammals (Talbot and McCulloch 1965), to name a few. No such relationship has been reported for the Wolf. This study was conducted to determine if a correlation between Wolf weight and chest girth existed.

Methods

Wolves were captured with foothold traps and neck snares during routine livestock depredation control activities by U.S. Department of Agriculture — Wildlife Services personnel. Wolves were taken in 15 counties in northern and central Minnesota from June

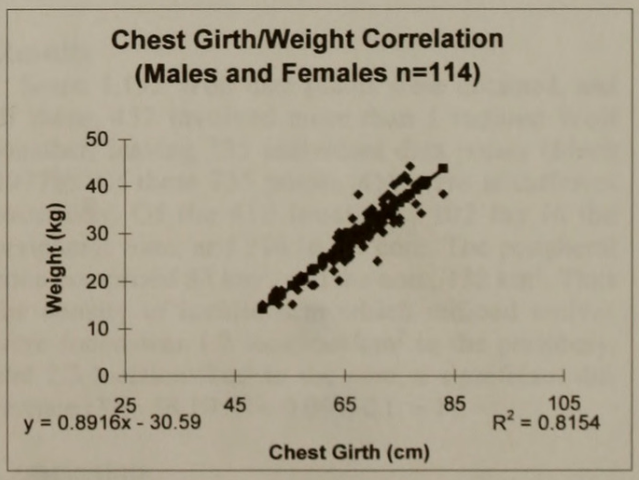

FIGURE 1. Relationship between chest girth (cm) and weight (kg) of Wolves in Minnesota, 1995–1997.