

Differential Use of a Wolf, *Canis lupus*, Pack Territory Edge and Core

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Based on 418 radio-locations of a Minnesota Wolf pack, Wolves were found at significantly fewer locations per area in the outer 2 km of the territory than in the core. This finding supports an hypothesis that buffer zones exist between pack territories and may explain why prey survive longer there.

Key Words: Wolf, *Canis lupus*, buffer zone, territory, White-tailed Deer, *Odocoileus virginianus*, predator, prey

Mech (1977a,b) postulated that Wolves (*Canis lupus*) may use the edges of their territories less than their centers. This proposal was based on his finding that the main prey of the wolves in his northeastern Minnesota study area, White-tailed Deer (*Odocoileus virginianus*), survived longer along Wolf pack territory edges than centers (Hoskinson and Mech 1976, Mech 1977b, Rogers et al. 1980, Nelson and Mech 1981).

Similar Wolf-deer relationships were observed in northwestern Minnesota (Fritts and Mech 1981) and on Vancouver Island, British Columbia (Hebert et al. 1982, Hatter 1984). Furthermore, theoreticians have found mathematical support for the pack territory edge as a prey refuge (Lewis and Murray 1993), and others have described similar prey-rich zones between warring Indian tribes (Hickerson 1965, 1970, Martin and Szuter 1999).

The explanation proposed for higher deer survival along Wolf pack territory edges was the possibility that Wolves spend less time along the edges because of the increased chance of encountering neighboring packs and hence intraspecific strife there. The territory edges were thus thought to be a "no man's land" or buffer zone between neighboring packs. Indeed a disproportionate number of Wolf-killed Wolves have been found in these buffer zones both in Minnesota (Mech 1994) and Alaska (Mech et al. 1998).

Although Mech (1977b) stated that the pack he studied seemed to spend less time in its territory buffer zone, only Carbyn (1983) has analyzed data to test this hypothesis. Such a test requires more location data for a single pack than are usually obtained. Here we examine a large collection of location data for one pack. We hypothesized that if Wolves tend to spend less time in their territory buffer zone, the number of Wolf locations determined by telemetry there should be significantly less per area than in the remaining core area.

Study area and Methods

We studied the Harris Lake (HL) Wolf pack that

inhabited the Superior National Forest (SNF) of northeastern Minnesota. The Wolf packs in the SNF are spaced into territories, and the HL Pack territory, 19.2 km southeast of Ely (48°N, 92°W.), was surrounded by five or six other pack territories (Mech 1973). The terrain, vegetation, and land use in the territory are typical of the surrounding region and were described by Mech (1977b).

The HL pack data we used were collected by aerially radio tracking eight members of the pack of two to nine Wolves from late 1968 through early 1975 (Mech 1977b). We drew a minimum convex polygon (MCP; Mohr 1947) around a plot of the composite data from this period (Mech 1977b: Figure 5N). We divided the plot into a core area and a peripheral zone separated by a line paralleling the MCP 2 km inside (Mech 1977a). The areas of the peripheral zone and core were calculated, and the number of locations in each were tallied. Multiple points at the same location were only counted once; because most such multiple points were in and near dens in the core, any resulting bias from deleting these points would weigh against the hypothesis of fewer locations in the peripheral zone.

Results

Some 1,192 Wolf data points were obtained, and of these, 457 involved more than 1 radioed Wolf together, leaving 735 individual data points (Mech 1977b). Of these 735 points, 418 were at different locations. Of the 418 locations, 102 lay in the peripheral zone, and 316 in the core. The peripheral zone comprised 85 km², and the core, 138 km². Thus the density of locations at which radioed wolves were found was 1.2 locations/km² in the periphery, and 2.3 locations/km² in the core, a significant difference ($X^2 = 18.10$; $P < 0.001$; d.f. = 1).

Conclusion

Except for data from one of two packs studied by Carbyn (1983), these results represent the first sup-

port for the hypothesis that Wolves spend less time along the edge of their territory than in the center (Mech 1977a,b), and this finding may explain why deer survive longer along those edges, as documented above. This analysis, however, involves only a single Wolf pack territory. Additional testing with other territories for which large amounts of location data are available is necessary to further test this hypothesis further.

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