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INTERACTIONS OF WOLVES AND BLACK BEARS IN NORTHEASTERN MINNESOTA

Wolves (*Canis lupus*) and black bears (*Ursus americanus*) were sympatric throughout much of their former ranges in North America and still co-inhabit large parts of Canada, Alaska, and Minnesota (Hall and Kelson, 1959; Mech, 1970). However, the only published records of interactions between them are a trapper's description of wolves killing a black bear of unknown age and sex (Young and Goldman, 1944) and a report by Joslin (1966) of a black bear killing an adult female wolf near a den of pups. In addition, C. C. Dickson (pers. comm.) found that wolves killed an immature black bear in northern Ontario on 18 May 1979. We now report on interactions between wolves and bears observed during concurrent telemetry studies of both species in northeastern Minnesota between 1969 and 1979 (Rogers, 1977; Mech, 1979). Territories of wolves and bears commonly overlapped in this area.

On 16 June 1972, a radio-tagged, 11-year-old female bear was observed from the air as she walked toward an adult wolf lying in a grassy opening. The bear was in her territory, and the

wolf was less than 100 m from an area of well-worn beaver (*Castor canadensis*) trails that wolves frequented. With approximately 30 m separating the two animals, the bear suddenly ran toward the wolf, which sprang up and was pursued vigorously in circles and zig-zags for approximately 25 s before it escaped into dense streamside brush. The bear walked back in the direction from which she came. On 18 September of that year, the same female bear remained at her bedsite while a wolf pack howled repeatedly within 250 m of her. During the next 4 days, she constructed her den less than 300 m from a rendezvous site that was in constant use by the wolf pack.

On 23 May 1973, a radio-tagged, 6-year-old female bear was observed from the air 6 m up in a tree 25 to 50 m from an active wolf den. At least one yearling wolf lay about 10 m from the tree facing the bear. The 58 to 62 kg bear was within her territory.

On 12 June 1973, a wolf approached to within 5 m of a tree in which a bear had left her cubs while she fed in a garbage pit 25 m away. The mother immediately ran from the pit and closely pursued the wolf for 30 to 50 m. On another occasion at the garbage pit (12 August 1976), four wolves approached but did not enter the pit where two adult bears fed. Two subadult bears sparred playfully near the pit and within 10 m of an adult wolf. Suddenly, one of the subadult bears stopped sparring and pursued the wolf 30 m to forest cover. The wolf reappeared shortly but was not chased again even though it approached to within 10 or 15 m of the sparring bears. Two or three more bears arrived, and the wolves left.

Of 206 occupied bear dens examined one to eight times each, only two showed signs of being visited by wolves. Additional sign possibly was covered by snow. Dens differed in characteristics from secure caves or burrows to nests constructed above ground. In one of the two visits, tracks indicated that a wolf pack gathered at the den of a radio-collared, 5-year-old female on 10 November 1970. Her den was a 2-m deep burrow under a stump and had a single entrance that seemed barely large enough for the 43-kg bear to enter. The bear was shot in the abdomen 5 months earlier and died of her injuries about 24 November. However, the bear was still vigorous at the time of the visit (as evidenced by her subsequent travels), and there was no sign of physical contact between the bear and the wolves.

In the remaining instance of wolves visiting a bear den, a wolf pack that included radio-collared members killed a radio-collared, 16-year-old female bear and her newborn cubs on 17 or 18 February 1977. The wolf pack was known to consist of nine members, although only six were seen from the air on 18 February when the pack was resting near the partially eaten carcass. The bear's weight at the time of the attack was about 72 kg. Her den site, a shallow depression under five logs 10 to 30 cm in diameter, afforded her no protection on either side. Only 35 cm of snow had accumulated by 18 February, and the unusually light snowfall did not cover the den as it would have in most winters.

Analyses of a photograph taken from a plane on 18 February and sign observed at the site on 21 March 1977 provided evidence of the interaction. The wolves apparently attacked from both sides and drove the bear from the den. The bear fought her way 22 m to the nearest big tree, a mature aspen (*Populus tremuloides*), leaving a path of broken brush and bear fur. At the tree, the fight continued; trampled brush, part of a wolf canine tooth, tufts of wolf fur, and much bear fur were concentrated in a 3-m radius around the tree. The bear possibly was injured as there were drops of blood on the tree, but claw marks indicated that she climbed to the safety of the crown. She eventually came down and returned to the den where she died or was killed. Bear fur covered the snow within 2 or 3 m of the den. Tracks visible in the photographs showed that the wolves dragged the carcass beyond the fur-covered area to consume it. By 21 March, all that remained of the carcass was fur, fragments of bone, and the nearly intact skull. Wolf droppings in the vicinity contained claws of the newborn cubs.

The death of this family was the only known predation loss to occur during 206 bear-years of radio-tracking bears 1 year of age or older (Rogers, in press). This interaction occurred after a decline in the primary prey of the wolf in Minnesota, the white-tailed deer (*Odocoileus virginianus*) (Mech and Karns, 1977). The wolf pack was trespassing in another pack's territory when it killed the bear.

Only 19 (1.3%) of 1,475 wolf droppings collected by Byman (1972) and Frenzel (1974) during snowfree periods in northeastern Minnesota contained bear remains. Sixteen of the 19 droppings with bear remains were collected from a single location near a residential area where bears were shot as nuisances (Byman, 1972; D. Ross, pers. comm.). Similarly, in central Ontario, Voigt et al. (1976) found bear hair in very few (number not given) of 1,943 wolf droppings they col-

lected. Again, most of the droppings with bear remains were collected near residential areas, suggesting scavenging of bears killed by people (G. Kolenosky, pers. comm.).

Although black bears occasionally were aggressive toward wolves, we found no evidence that bears regarded wolves as prey. The "bear-killed wolf reported by Joslin (1966) was not eaten, and we found no wolf remains in more than 1,200 bear droppings. Our observations indicate that single wolves tend to flee from bears but wolf packs are capable of killing bears as large as adult females.

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LYNN L. ROGERS¹ AND L. DAVID MECH,² ¹USDA North Central Forest Experiment Station, 1992 Folwell Ave., St. Paul, MN 55108 and ²Putuxent Wildlife Research Center, U.S. Fish and Wildlife Service, Laurel, MD 20811 (mailing address of Mech: North Central Forest Experiment Station, 1992 Folwell Ave., St. Paul, MN 55108). Submitted 7 July 1980. Accepted 23 September 1980.