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Occurrence of Rabies in a Wolf Population in Northeastern Alaska

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ABSTRACT: Nine Alaskan wolves (*Canis lupus*) were found dead during spring and summer 1985; five of seven animals tested for rabies virus were positive. The 1985 epizootic altered annual den use patterns by wolves in northeastern Alaska, but did not appear to affect population size. We propose that rabies in arctic wolves may be more common than previously thought.

Key words: Rabies, wolves, *Canis lupus*, northeast Alaska, denning.

Alaska (USA) has a land mass of more than 1.5 million km^2 and an estimated wolf (*Canis lupus*) population of between 6,000 and 8,000 animals (Alaska Department Fish and Game files). Although the current distribution of wolves includes approximately 85% of the state, confirmed cases of rabies in wolves had been documented in only 11 wolves prior to 1985. Rausch (1958) noted four documented cases—a May 1952 attack by a rabid wolf on dogs in the village of Anaktuvuk Pass in the central Brooks Range, an October 1954 attack on dogs at Kiana in western Alaska, and where wolves were involved in two of the three fatal human cases of rabies recorded in Alaska. Williams (1949) described a 1945 to 1947 epizootic within interior Alaska and he documented rabies in one wolf that was shot at Central, Alaska in December 1945. Chapman (1978) documented the decimation and dissolution of a wolf pack in northeast Alaska due to rabies. At least six of the ten members of the pack died after fighting with a member of the pack which was rabid. Three of the seven animals were verified rabid by the Alaska State Virology-Rabies Unit by direct immunofluorescent antibody procedures (Chapman, 1978).

The U.S. Fish and Wildlife Service initiated a baseline study of wolves on the arctic coastal plain and adjacent mountainous areas of the Arctic National Wildlife Refuge (Refuge) in northeastern Alaska (69°00′ to 70°10′N, 140°30′ to 147°00′W) in 1984. Our objective was to document an epizootic of rabies in wolves in northeastern Alaska, and evaluate the effects of this epizootic on the wolf population.

Wolves were radio-collared after using the helicopter darting techniques described by Weiler and Garner (1987). The immobilization drug M99 (etorphine hydrochloride, 1 mg/ml, Lemmon Company, Sellersville, Pennsylvania, USA) was injected intramuscularly (dosage: 1 mg M99/12 to 15 kg body weight) using Cap-Chur equipment (Palmer Chemical and Equipment Company, Douglasville, Georgia, USA). Each wolf was fitted with a radio collar prior to injecting the antagonist M-50-50 (diprenorphine, 2 mg/ml, Lemmon Company) in which two-thirds of the M-50-50 volume (dosage: 1 mg M50-50/4 to 5 kg body weight) was administered intravenously and the remaining one-third was administered intramuscularly to offset potential recycling of etorphine.

Movements, den locations, and location of mortalities of radio-collared wolves were determined with aerial tracking procedures. Radio-collared wolves were located weekly during May through September and less often through the remainder of the year. Den sites were located initially by tracking radio-collared wolves and subsequently monitored during the active denning period. Use of historic den sites was monitored using aerial reconnaissance of known den sites. Dead wolves were re-

covered using a helicopter and shipped to the Alaska Virology-Rabies Laboratory (now State Public Health Laboratory, University of Alaska Fairbanks, Alaska, USA).

Rabies was diagnosed using laboratory methods of Johnson (1979). Touch impression smears were made of the pons, cerebellum, and hippocampus brain tissues from each animal onto fluorescent antibody slides (Cel-line Associates, Newfield, New Jersey, USA). Neural tissue was collected and temporarily stored for future reference. All slides were fixed in acetone ≥1 hr at −20 C, stained with an anti-rabies conjugate (fluorescein-isothiocyanate, VWR Scientific, Seattle, Washington, USA), counter-stained with 0.01% Evans Blue (Sigma Chemical Company, St. Louis, Missouri, USA) for 30 min, and examined with a fluorescent microscope using an incident light system (Leitz Dialux Model 20, Leica Incorporated, Wetzler, Germany).

Twenty-six wolves were captured during 19 May to 5 July 1984 and 6 April to 24 August 1985, of which seven were single wolves not associated with a pack (Weiler and Garner, 1987). Six of the 26 marked wolves and three unmarked wolves were found dead between April and August 1985. Five of the seven tested animals were positive for rabies. The five rabid wolves (W05, W09, W12, W16, and UM1) were found between 7 April and 17 May 1985 over a linear distance of approximately 265 km (68°38′ to 69°29′N, 141°27′ to 147°50′W). Two wolves (W14 and UM3) were in advanced stages of decomposition and were not suitable for laboratory examination. However, both animals were associated with known rabies-positive wolves. In addition, wolf W14 was found in the Canning North den with large numbers of porcupine quills lodged in the face and muzzle, a phenomenon noted in rabid foxes (Rausch, 1977). We infer from these conditions that rabies was the cause of death for these two wolves, although other causes are possible. Causes of death for the rabies negative wolves (UM2 and W13) were undetermined.

Periodic epizootics of rabies are common in arctic foxes (*Alopex lagopus*), which are the principal reservoir of rabies in the arctic (Rausch, 1958; Kantorovich, 1964; Syuzyumova, 1968). Rabies occurs among foxes seasonally, starting in September reaching a peak in March, and declining in June. Major epizootics occur at 3- to 4-yr intervals and an epizootic began in January 1984 among arctic fox in western Alaska. The disease had spread to arctic fox in northeastern Alaska by April 1985 (Ritter, 1988).

We speculate that the 1985 rabies epizootic in wolves in northeast Alaska originated from arctic foxes. This epizootic and the one reported by Chapman (1978) would have gone undetected had the wolf population not been the subject of on-going research. Undetected epizootics of rabies in wolves in arctic Alaska may occur in cycles coincident with those of the principal reservoir host, the arctic fox. The geological features of northeastern Alaska may have facilitated interactions between the two species, where the mountainous terrain used by wolves for denning is contiguous with the coastal habitats used by arctic foxes.

Ten den sites were documented in the study area (69°00′ to 69°33′N, 140°28′ to 145°53′W). Four den sites were active during summer 1984, six during summer 1985, four during summer 1986, and five during summers 1987 and 1988. Wolves use den sites repeatedly through time (Ballard and Dau, 1983; Fuller, 1989; Ciucci and Mech, 1992), and this use may span many years (Mech and Packard, 1990). In Chapman's case (1978), the southern Hulahula River den site was abandoned; based on Refuge aerial reconnaissance records of the den site, wolves probably had not used this site since the 1977 epizootic. The 1985 epizootic appeared to have a similar effect on several den sites.

The Kongakut den was active during

most years between 1975 and 1984, based on Refuge aerial reconnaissance records. This den was not used during spring 1985 after the alpha female (W09) died from rabies ; it was occupied briefly during early May 1986 and abandoned by mid-May, and was not used during spring 1987 and 1988. Coincidentally, the Malcom den site, proximal to the Kongakut den site, did not exist in 1984, but was established in 1985 and was used annually through 1988.

Use of the Egaksrak and Aichilik den sites by wolves appeared to be related. The Aichilik site was used during 1984, was not used in 1985 when the alpha male (W16) died of rabies, and was used annually from 1986 through 1988. The Egaksrak den site was first used during spring 1985 (possibly by remnants of the Aichilik or Kongakut packs). The den was not used during spring 1986 when wolves that used the Egaksrak den site during 1985 occupied the Aichilik den site during 1986 and annually through 1988. The Egaksrak den site was reoccupied during 1988.

The Canning North den had historically been active since 1972, based on Refuge aerial reconnaissance records. The pack had four members during spring 1985 (three females, one male); however, the male disappeared during spring 1985, and two of the females denned in separate dens along the Canning River. The Canning South female (W13) abandoned the den in mid-June and was found dead of unknown causes shortly thereafter. Female W14 was found dead of suspected rabies at the Canning North den site. Neither den site was used after 1985, although wolves still were observed in the area (Weiler and Garner, 1987).

The Sadelrochit den was disrupted due to hunting by humans during winter 1984 and 1985, and was not used during spring 1985. The surviving female initiated a new den at the Hulahula North den site during spring 1985. The resultant pack abandoned the Hulahula North den site and occupied the Sadelrochit den site during spring 1986 through 1988. We infer from these data that epizootics of rabies in wolves altered den site use patterns in northwest Alaska.

Collared wolves moved extensively throughout northeastern Alaska and northern Yukon, Canada, and movement was more extensive for the seven collared wolves which were not affiliated with a known pack. Movements of ten wolves dispersing from the area averaged 230 km, with one wolf moving 776 km to the west (Weiler and Garner, 1987). Wide ranging or dispersing wolves could serve as an amplifying agent in the transmission of rabies from a localized epizootic among arctic foxes, which are normally restricted to coastal areas, to adjacent inland areas where wolves are more common. However, the incubation period of rabies in wolves appears to be approximately 3 wk (Rausch, 1958), with death occurring within 4 wk of exposure (Chapman, 1978). During the 1985 epizootic, two wolves were captured and marked less than 4 wk prior to their death caused by rabies. Wolf W16 was found dead 9.8 km south of the original capture site after a 16-day interval between capture and death. Wolf W12 had moved 74.8 km southwest of the original capture site during a 20-day period between capture and death.

Cowan (1949) speculated that rabies could function as a population regulating factor in arctic Canidae; however, no decrease in wolf density was evident during the years following the 1985 epizootic in northeast Alaska (Weiler and Garner, 1987). The absence of a long-term decline may result from immigration and subsequent recovery via reproduction, as suggested by Chapman (1978). Also, sport and subsistence harvest of wolves by humans may influence wolf numbers in northeast Alaska. The subsistence harvest during 1984 and 1985 was 10 animals (Alaska Department of Fish and Game files). Three hunter-killed animals in 1985 were 9% of the 1984 fall population (34 animals), while

the total known mortality (human and natural) in 1985 represented 35% (12 animals) of the 1984 fall population of 34 animals. However, the 1985 fall population was 36 animals, with twice as many pups in the population after the rabies epizootic (seven pups in 1984 versus 14 pups in fall 1985) (Weiler and Garner, 1987).

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LITERATURE CITED

BALLARD, W. B., AND J. R. DAU. 1983. Characteristics of gray wolf, *Canis lupus*, den and rendezvous sites in southcentral Alaska. Canadian Field-Naturalist 97: 299–302.

CHAPMAN, R. C. 1978. Rabies: Decimation of a wolf pack in arctic Alaska. Science 201: 365–367.

CIUCCI, P., AND L. D. MECH. 1992. Selection of wolf dens in relation to winter territories in northeastern Minnesota. Journal of Mammalogy 73: 899–905.

COWAN, I. MCT. 1949. Rabies as a possible population control of arctic Canidae. Journal of Mammalogy 30: 396–398.

FULLER, T. K. 1989. Denning behavior of wolves in north-central Minnesota. American Midland Naturalist 121: 184–188.

JOHNSON, H. N. 1979. Rabies virus. *In* Diagnostic procedures for viral, rickettsial and chlamydial infections, 5th ed., E. H. Lennette and N. J. Schmidt (eds.). American Public Health Association Incorporated, Washington, D.C., pp. 843–847.

KANTOROVICH, R. A. 1964. Natural foci of rabies-like infection in the far north. Journal of Hygiene, Epidemiology, Microbiology and Immunology 8: 100–110.

MECH, L. D., AND J. N. PACKARD. 1990. Possible use of wolf, *Canis lupus*, den over several centuries. Canadian Field-Naturalist 104: 484–485.

RAUSCH, R. L. 1958. Some observations on rabies in Alaska, with special reference to wild Canidae. The Journal of Wildlife Management 22: 246–260.

———. 1977. Rabies in Alaska, prevention and control. U.S. Department Health, Education, and Welfare, Report Number 111, Arctic Health Research Center, Fairbanks, Alaska, 22 pp.

RITTER, D. G. 1988. State of Alaska rabies certification manual. State Public Health Laboratory, Fairbanks, Alaska, pp. 15H–J, 16–18.

SYUZYUMOVA, L. M. 1968. Epizootiology of rabies among arctic foxes on the Yamal Peninsula. Problemy Severa 11: 99–103.

WEILER, G. J., AND G. GARNER. 1987. Wolves of the Arctic National Wildlife Refuge: Their seasonal movements and prey relationships. *In* 1985 update report; baseline study of the fish, wildlife, and their habitats. G. W. Garner and P. E. Reynolds (eds.). U.S. Fish and Wildlife Service, Anchorage, Alaska, pp. 692–742.

WILLIAMS, R. B. 1949. Epizootic of rabies in interior Alaska 1945–1947. Canadian Journal of Comparative Medicine 13: 136–143.

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