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Authors: Phillips, Michael K., and Scheck, Jerrold

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Parasitism in Captive and Reintroduced Red Wolves

Michael K. Phillips[1] **and Jerrold Scheck,**[2] [1] Alligator River National Wildlife Refuge, United States Fish and Wildlife Service, P.O. Box 1969, Manteo, North Carolina 27954, USA; [2] Department of Wildlife and Range Sciences, University of Florida, Gainesville, Florida 32611, USA

ABSTRACT: Fecal examinations revealed that at least 10 of 21 (48%) captive red wolves (*Canis rufus*) and eight of 12 (67%) free-ranging red wolves were infected with intestinal parasites. No captive wolves and only one of seven reintroduced wolves had dirofilariasis. Ticks were collected from 10 of 21 (48%) captive wolves and nine of 12 (75%) free-ranging animals. Ivermectin administered at a dosage of 50 μg/kg of estimated body weight every 30 to 60 days apparently prevented or ameliorated parasitism in red wolves.

Key words: Captivity, *Canis rufus*, free-ranging, parasitism, red wolf, reintroductions.

The endangered red wolf (*Canis rufus*) has been the focus of a recovery program since the 1970's (Phillips and Parker, 1988). The U.S. Fish and Wildlife Service (USFWS) recently initiated captive/reintroduction projects at the Alligator River National Wildlife Refuge (ARNWR), North Carolina (USA) in 1986, and on Bulls Island (BI), South Carolina in 1987. The reintroduction project at ARNWR is the first attempt in history to restore a carnivore species that was extinct in the wild.

Researchers studying naturally occurring wild red wolves determined that heartworms (*Dirofilaria immitis*), hookworms (*Ancylostoma caninum*), and sarcoptic mange (*Sarcoptes scabiei*) were important sources of mortality (Riley and McBride, 1972; Carley, 1975; Custer and Pence, 1981; Pence et al., 1981). However, data are not available concerning parasitism of captive or reintroduced red wolves. Thus, a parasite-monitoring program was integrated into the captive/reintroduction projects. Objectives of the monitoring program were to identify parasites and determine the prevalence of parasitism.

ARNWR (50°30′N, 53°30′W) consists of 477 km² of marshes, nonriverine swamp forests, pocosins, and agricultural fields. BI (79°36′N, 32°54′W), a 20-km² barrier island component of the Cape Romain National Wildlife Refuge, consists of maritime forests and salt marshes. The climate of both areas is characterized by hot summers, mild winters, and high humidity.

From December 1986 to February 1989, 21 captive wolves were studied at ARNWR (16 adults and five pups). Captive adults were examined for intestinal and ectoparasites as well as dirofilariasis; pups were examined for intestinal and ectoparasites. Captive wolves resided for 10 wk to 24 mo in 625 m² naturally vegetated enclosures located at remote sites within ARNWR. Usually two animals shared a pen. Captive wolves were fed 2 to 3 kg of dry dog food, whole and eviscerated prey items, and/or live animals usually every 2 to 3 days. Water was provided ad libitum. Using techniques listed below, captive wolves were determined to be parasite-free upon release.

From September 1987 to January 1989, 11 free-ranging wolves (nine reintroduced adults and two wild-born pups) were studied at ARNWR and three reintroduced animals (one adult and two pups) were studied at BI. Of these 13 animals, 12 were examined for intestinal and ectoparasites, and seven were tested for dirofilariasis. Pups were defined as animals <1-yr-old.

Presence of parasite eggs in wolf feces was determined by flotation of samples in a sodium nitrate solution (specific gravity 1.200). Fecal samples were collected when we handled animals, from the pens of captive animals, and from roads used by free-ranging wolves. Because captive animals were maintained usually as pairs, fecal

samples from pens frequently could not be assigned to individuals. Thus, we collected several fresh scats (<48-hr-old) from each pen and assumed that parasitic infections were similar for all animals within an enclosure. Samples from roads were collected while driving predetermined routes selected to minimize bias toward individuals. Only scats believed to have been deposited within 72 hr were collected from roads. Tracks at collection sites along with the unique morphology and odor of excreta made wolf scats identifiable. Coyotes (*Canis latrans*) do not inhabit ARNWR or BI.

The membrane filtration technique and modified Knott's techniques were used to detect heartworm microfilaria in blood samples, while ELISA methods were used to detect the presence of heartworm antigen in serum samples (Cite Semi-Quant, IDEXX Inc., Portland, Maine 04101, USA; and ClinEase-CH, SYNBIOTICS Corp., San Diego, California 92127, USA).

We inspected wolves for about 5 min to collect ectoparasites which were stored in 70% ethyl alcohol until identification by the National Veterinary Sciences Laboratories (APHIS, USDA, Ames, Iowa 50010, USA). The intensity of tick infestations were ranked according to the number of ticks counted: zero, no ticks; low, one to 10 ticks; moderate, 11 to 20 ticks; and high, 21 or more ticks.

All captive animals received prophylactic treatment for parasites. Ivermectin (Merck, Sharp and Dohme, Rahway, New Jersey 07065, USA) was administered at an average dosage of 50 μg/kg of body weight every 30 to 60 days starting in January 1987. Ivermectin was mixed with food for two consecutive feedings to ensure ingestion by all wolves in a pen.

Starting in May 1988, ivermectin was administered to three reintroduced wolves. Every 30 to 60 days two pieces of meat were treated with ivermectin at a dosage of 50 μg/kg of estimated body weight and then placed near the animals. This procedure was repeated 24 to 72 hr later to ensure ingestion by all wolves in the area. Ingestion was confirmed by noting wolf tracks and scats at the placement site.

Intestinal parasites infected 10 of 21 (48%) captive wolves and eight of 12 (67%) free-ranging wolves. Hookworms infected five (24%) captive wolves and eight (67%) free-ranging wolves. Ascarids infected five (24%) captive wolves, whereas they infected only one (8%) free-ranging wolf. All samples containing ascarid eggs were from pups. Whipworm eggs were not seen in scats from the captive animals, and only one (8%) free-ranging wolf harbored whipworms. One (5%) captive wolf and three (25%) free-ranging wolves had tapeworm eggs (*Taenia* spp.).

All blood samples from the captive wolves were negative for dirofilariasis. Of the seven free-ranging wolves tested for dirofilariasis, only one (14%) was positive. She had not received ivermectin during the 15 mo prior to examination. The free-ranging adult male that repeatedly received ivermectin tested negative for dirofilariasis. Five other free-ranging wolves (two adults and three 7-mo-old pups) that had not received ivermectin during the previous 6 mo also tested negative for dirofilariasis.

Thirteen of 125 (10%) examinations of captive wolves revealed ticks on 46% of the wolves. Twelve of 22 (55%) examinations of free-ranging wolves revealed ticks on 75% of the animals. No other ectoparasites were detected.

The severity of tick infestations experienced by the two populations was different. One of 125 (1%) examinations of captive wolves revealed moderate or high numbers, whereas seven of 22 (32%) examinations of free-ranging wolves revealed moderate or high numbers. Three of four wolves released during April 1988 developed heavy infestations of ticks within 1 to 2 mo. The fourth animal was not examined.

Of the 103 ticks removed from captive and free-ranging wolves, 79 (77%) were

American dog ticks (*Dermacentor variabilis*), 19 (18%) were lone star ticks (*Amblyomma americanum*), and 5 (5%) were black-legged ticks (*Ixodes scapularis*).

Although all intestinal parasites detected in this study are potentially pathogenic (Gaafar, 1979), only hookworms occurred frequently enough to be of immediate concern to red wolf reintroductions. However, because of the reproductive biology of intestinal parasites our estimates of infection by intestinal parasites is probably conservative. Hookworms probably impact red wolf populations by causing juvenile mortality (Custer and Pence, 1981). For intestinal parasites, the ivermectin regime implemented was only effective at eradicating or ameliorating hookworm infections.

Heartworms were one of the most important mortality factors affecting wild red wolves in Texas and Louisiana (Carley, 1975). We were able to prevent dirofilariasis in select free-ranging wolves and all captive animals by administering ivermectin. Due to the reproductive biology of heartworms our estimates of dirofilariasis may be conservative.

The near absence of ticks on captive wolves was due to a low number of ticks in the enclosures due to an absence of suitable habitat. The large number of ticks on reintroduced wolves caused considerable irritation of the skin; many of the bite sites appeared infected and had developed into abscesses.

Clearly, parasitism will be important to populations of reintroduced and captive red wolves. Thus, parasites should be considered when designing and implementing restoration projects. For example, since tick infestations will probably be most severe during summer, it may be advisable to release captive wolves during early fall. Such a strategy would provide animals maximal time to adjust to life in the wild before having to contend with possibly heavy infestations of ticks.

Because populations of reintroduced red wolves will usually involve a small number of very valuable individuals, prophylactic parasite control should be practiced including routine examinations of feces for ova. Ivermectin is recommended as the parasiticide because of its broad spectrum of single dose effectiveness. Although the safety assessment of ivermectin is not yet complete (Campbell and Benz, 1984), red wolves could have ingested up to 0.2 mg ivermectin/kg body weight over a 2-day period, and in two cases wolves probably ingested 0.5 mg ivermectin/kg body weight during 48 hr with no apparent ill effects.

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LITERATURE CITED

CAMPBELL, W. C., AND G. W. BENZ. 1984. Ivermectin: A review of efficacy and safety. Journal of Veterinary Pharmacology and Therapeutics 7: 1–16.

CARLEY, C. J. 1975. Activities and findings of the red wolf recovery program from late July 1973 to July 1, 1975. U.S. Fish and Wildlife Service, Albuquerque, New Mexico, 215 pp.

CONOVER, W. J. 1980. Practical nonparametric statistics. John Wiley and Sons, New York, New York, 493 pp.

CUSTER, J. W., AND D. B. PENCE. 1981. Ecological analyses of helminth populations of wild canids from the gulf coastal prairies of Texas and Louisiana. The Journal of Parasitology 67: 289–307.

GAAFAR, S. M. 1979. Internal metazoal and protozoal diseases. *In* Canine medicine, E. J. Catcott (ed.). American Veterinary Publications, Santa Barbara, California, pp. 93–140.

PENCE, D. B., J. W. CUSTER, AND C. J. CARLEY.

1981. Ectoparasites of wild canids from the gulf coastal prairies of Texas and Louisiana. Journal of Medical Entomology 18: 409–412.

PHILLIPS, M. K., AND W. T. PARKER. 1988. Red wolf recovery: A progress report. Conservation Biology 2: 139–141.

RILEY, G. A., AND R. T. MCBRIDE. 1972. A survey of the red wolf (*Canis rufus*). Scientific Report No. 162. U.S. Fish and Wildlife Service, Washington, D.C., 15 pp.

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