Proc. Helminthol. Soc. Wash.
47(1), 1980, p. 100–105

Helminths of the Common Crow, *Corvus brachyrhynchos* Brehm, from West Texas

JUSTIN NADERMAN AND DANNY B. PENCE

Department of Range and Wildlife Management, Texas Tech University, Lubbock, Texas 79409, and Department of Pathology, Division of Comparative Pathology, Texas Tech University Health Sciences Centers, Lubbock, Texas 79430

ABSTRACT: Three nematode, two cestode, one trematode, and two acanthocephalan species were collected from 65 of 68 (96% infected) common crows, *Corvus brachyrhynchos,* from western Texas. These included *Acuaria anthuris* (33.8% infected), *Microtetrameres helix* (69.0%), *Splendidofilaria* sp. (2.9%), *Hymenolepis corvi* (55.9%), *Anomotaenia constricta* (26.5%), *Zonorchis petiolatus* (2.9%), *Mediorhynchus grandis* (5.9%), and *Centrorhynchus* sp. (1.5%). Hosts were infected with one to four ($\bar{x}$ = 2.1) helminth species per individual. Simpson's index for west Texas crows was low (0.25), indicating a lack of dominance by particular helminth species. Indices of similarity of the helminth faunas of crows from different geographic areas in North America were low, indicating a dispersed fauna, except between the west Texas and Wisconsin-Iowa helminth faunas, which appeared very similar. The only significant association between common helminth species in terms of frequency of occurrence and intensity of infection was between *M. helix* and *H. corvi.* Possibly these species share a common intermediate arthropod host. A new host record is established for *Zonorchis petiolatus.*

The common crow, *Corvus brachyrhynchos,* is the most common, widely distributed, and omnivorous species of the Corvidae in North America. The Texas population is a resident breeding population, but during autumn and winter it is supplemented by migrants from other areas. Although the helminth parasites of the crow have been investigated in Oklahoma (Ward, 1935), southern Wisconsin and Iowa (Morgan and Waller, 1941), Virginia (Daly, 1959), North Carolina (Hendricks et al., 1969), Newfoundland (Andrews and Threlfall, 1975), and Ohio (Jones, 1968; Fendinger, 1952), there is no available information on the helminth fauna of this species from west Texas. Consequently, the present study was initiated in order to (1) examine the composition and prevalence of helminth parasites of the common crow from this area, (2) compare helminth faunas of this host from different geographic regions in North America, and (3) examine species interactions of common helminths in this host.

Materials and Methods

Sixty-eight crows were collected by shooting near Brownfield, Terry Co., Texas in October and November 1975. Entire carcasses were frozen for later necropsy. Sex and age data were not obtained. Viscera were examined for helminths grossly and with a dissecting microscope. Nematodes were briefly fixed in glacial acetic acid, preserved in a mixture of 70% ethyl alcohol with 5% glycerine, and examined in glycerine wet mounts after evaporation of the alcohol. Trematodes, cestodes, and acanthocephalans were briefly fixed in AFA, stained in Celestin blue B or Semicohn's acetic carmin, and mounted in Canada balsam. Simpson's index and a similarity index comparing the helminth faunas of crows from different geographic regions in North America were computed according to Holmes and Podesta (1968). The latter values were arranged in a trellis diagram. Significant interactions of the four common helminth species (*Acuaria anthuris, Micro-*

Table 1. Helminths of the common crow from west Texas.

	Site of infection*	Prevalence: No. infected/ No. examined	Prevalence: %	Intensity: Range	Intensity: Mean
Nematoda					
Acuaria anthuris (Rudolphi, 1819) Williams, 1929	G	23/68	33.8	1–30	3.9
Microtetrameres helix Cram, 1927	P	48/68	70.5	1–74	13.3
Splendidofiliaria sp.	B	2/68	2.9	2–3	2.5
Cestoda					
Anomotaenia constricta (Molin, 1858) Mettrick, 1958	I	18/68	26.5	1–15	3.8
Hymenolepis corvi (Mayhew, 1925) Yam, 1956	I	38/68	55.9	1–31	4.7
Trematoda					
Zonorchis petiolatus (Railliet, 1900) Denton and Byrd, 1951	L	2/68	2.9	1	1
Acanthocephala					
Mediorhynchus grandis (Van Cleave, 1916) Pachyman and Berry, 1948	I	4/68	5.9	1–2	1.5
Centrorhynchus sp.	I	1/68	1.5	1	1

* G, gizzard; P, proventriculus; B, body cavity; I, intestine; L, liver.

tetrameres helix, *Anomotaenia constricta*, and *Hymenolepis corvi*) were determined in terms of frequency of occurrence by total chi-square analysis using 2 × 2 contingency tables where species pairs were considered in terms of both species present, one present to the exclusion of the other, and both species absent (Sokal and Rohlf, 1969). Cole's coefficients of association were computed to determine

Table 2. Comparison by *t*-tests of mean levels of infection of common helminths in the common crow from west Texas.

		A. constricta	*H. corvi*	*A. anthuris*	*M. helix*
A. constricta	+		2.6 (11)*	2.5 (4)	8.5 (15)
			1.185†	0.519	1.530
	−		5.5 (27)	4.2 (19)	15.5 (32)
H. corvi	+	4.5 (8)		2.7 (14)	10.4 (23)
		0.956		1.232	1.343
	−	2.9 (10)		5.8 (9)	16.1 (24)
A. anthuris	+	6.0 (4)	5.8 (14)		16.5 (15)
		1.455	0.782		1.014
	−	3.1 (14)	4.0 (24)		11.8 (32)
M. helix	+	4.4 (14)	5.0 (23)	4.3 (15)	
		1.497	0.431	0.460	
	−	1.5 (4)	4.1 (15)	3.1 (8)	

* Mean infection level followed by sample size in parentheses, value for *t* between values for compared means.
† Significant at $P \leq 0.050$ ($N_1 + N_2 - 2$ df).

					–	Newfoundland
				–	9	North Carolina
			–	35	16	Ohio
		--	23	4	0	Virginia
	–		32	18	2	Wisconsin-Iowa
	78	14	38	16	0	West Texas
West Texas	Wisconsin-Iowa	Virginia	Ohio	North Carolina	Newfoundland	

Figure 1. Trellis diagram of indices of similarity of helminth faunas of common crows from different regions in North America.

a positive or negative interaction (Cole, 1957). For intensity of infection, each of the above common helminths was compared to every other common helminth species using *t*-tests on mean levels of infection (Snedecor and Cochran, 1967). Statistical inferences are reported at the $P \leq 0.05$ level. Representative specimens of helminths collected in this study are deposited in the Medical Zoology Collection, The Museum of Texas Tech University, TTUSMZ Nos. 14,636–14,972 and 14,993–15,003.

Results

Three nematode, two cestode, one trematode, and two acanthocephalan species were recovered from 65 of 68 common crows in west Texas (*Table 1*). Ninety-six percent of these hosts harbored from one to four ($\bar{x} = 2.1$) helminth species. Intensities of infection ranged from one to 104 ($\bar{x} = 15$) individual helminths per host.

Simpson's index for west Texas crows was low (0.25), indicating a lack of dominance of particular helminth species in this host. Likewise, Simpson's indices calculated for crows from other areas including North Carolina (Hendricks

			–	*A. constricta*
			0.147 (−0.048)	*H. corvi*
		–	0.177 (0.063)	2.120 (−0.391)	*A. anthuris*
	–	0.875 (−0.138)	*6.587 (−0.600)	0.806 (0.245)	*M. helix*
	M. helix	*A. anthuris*	*H. corvi*	*A. constricta*	

Figure 2. Total χ^2 values and Cole's coefficients (C_{ab}) of expected versus observed values of frequency of occurrence for pairs of common helminth species in the common crow from west Texas. * $P \leq 0.05$ (1 df).

et al., 1969), Ohio (Jones, 1968), Virginia (Daly, 1959), Newfoundland (Andrews and Threlfall, 1975), and southern Wisconsin and Iowa (Morgan and Waller, 1941) had correspondingly low values of 0.31, 0.11, 0.30, 0.15, and 0.29, respectively, indicating a lack of dominance.

Comparison of the helminth faunas of crows from the above different geographic areas in North America using an index of similarity indicated a basically different helminth fauna between most regions (Fig. 1). The highest value (78) was between the west Texas fauna and that of Wisconsin and Iowa, indicating a basically similar helminth fauna in these two regions. However, even in this case only three species were shared, although these were the overwhelmingly dominant (in terms of prevalence) species.

Multispecies interactions between common helminth species, as determined using chi-square analysis of frequency of occurrence, implicated only one association between helminth pairs (Fig. 2). There was a significant association between *Hymenolepis corvi* and *Microtetrameres helix*. Cole's coefficients indicated a negative association with the number of instances where both species were absent more frequently than expected, leading to a greatly increased chi-square value. There were no significant associations between the remaining pairs of helminth species. There were no significantly positive or negative associations in terms of intensity of infection between pairs of common helminth species in

the crow (Table 2). Likewise, it was not possible to analyze the prevalence or intensity of infection of helminth species in terms of host age or sex.

A new host record for *Zonorchis petiolatus* from the common crow is established. The remaining helminth species recovered in this study have been previously reported from this host.

Discussion

The results of the present study suggest *Corvus brachyrhynchos* is commonly infected (96% of hosts infected) with one or more helminth species in west Texas. Moreover, all but one of these helminth species have been reported previously from this host in North America. Andrews and Threlfall (1973) have provided a comprehensive list of parasites reported from the common crow in North America.

The low Simpson's indices for helminth faunas of this host from the several areas in North America where sufficient data are available (North Carolina, Ohio, Virginia, Wisconsin and Iowa, Newfoundland, and west Texas) indicate a lack of dominance of particular helminth species. Likewise, the low values for indices of similarity for crow helminth faunas between most of the above areas indicate a fairly diverse fauna. From the above six areas where surveys have been completed, only 14 of the 41 (35%) total helminth species are common to more than one area. Of these species, *Acuaria anthuris, Capillaria contorta,* and *Mediorhynchus grandis* occur in four of the six regions. Two nematodes (*Diplotriaena tricuspis* and *Microtetrameres helix*), two cestodes (*Anomotaenia constricta* and *Hymenolepsis corvi*), and one trematode (*Echinostoma revolutum*) each occur in three of the six areas. The low prevalence of shared species between areas, coupled with the low levels of infection of many of these species, accounts for the low values in the similarity indices between most areas. A notable exception is the high similarity index of the west Texas with the Wisconsin and Iowa crow helminth faunas. Although only three of 13 helminth species (*Acuaria anthuris, Microtetrameres helix,* and *Hymenolepis corvi*) are shared between the two regions, these were overwhelmingly the most prevalent species from both areas. The remaining helminths encountered in both areas were very infrequently encountered (low percent prevalence). Although the crow is a migratory species, this does not seem to have a pronounced effect on their helminth faunas, as reflected by the low similarity indices between most geographic regions. In this respect the helminth fauna of this species more closely resembles that of other vertebrates which are of wide geographic distribution occupying variable habitat types and are omnivorous in food habits, such as the coyote (Holmes and Podesta, 1968; Pence and Meinzer, 1979; Custer and Pence, in press) and bobcat (Stone and Pence, 1978) which have a diverse helminth fauna with a lack of dominance by particular helminth species.

Of the four common helminths found in the present study, only one species pair, *M. helix* and *H. corvi,* demonstrated a significant association in terms of frequency of occurrence. There were no significant associations of species pairs in terms of intensity of infection. Although the above species occur in different locations within the host, proventriculus and small intestine, both utilize arthropod intermediate hosts (Schell, 1953; Fendinger, 1952), which could account for the above association in terms of prevalence.

Acknowledgments

The authors appreciate the assistance of Robert Dowler and Houston McGough in collecting specimens and Valerie Young for technical assistance. This study was supported in part by the Institute for Museum Research, The Museum of Texas Tech University.

Literature Cited

Andrews, S. E., and W. Threlfall. 1973. A preliminary checklist of the helminth parasites of members of the genus *Corvus* (Aves). Wildl. Dis. No. 62. 97 pp. (Microfiche.)

Andrews, S. E., and W. Threlfall. 1975. Parasites of the common crow (*Corvus brachyrhynchos* Brehm, 1822) in insular Newfoundland. Proc. Helminthol. Soc. Wash. 42:24–28.

Cole, L. C. 1957. The measurement of partial interspecific association. Ecology 38:226–233.

Custer, J. W., and D. B. Pence. In press. Helminths of wild canids from the Gulf Coastal Prairies of Texas and Louisiana. J. Parasitol.

Daly, E. F. 1959. A study of the intestinal helminths of the southern crow (*Corvus brachyrhynchos paulus*) in Virginia. Proc. Helminthol. Soc. Wash. 26:26.

Fendinger, G. S. 1952. A study of parasites of the common crow, *Corvus brachyrhynchos*. M.S. Thesis, Ohio State University, Columbus. 44 pp.

Hendricks, L. D., R. Harkema, and G. C. Miller. 1969. Helminths of the crow, *Corvus brachyrhynchos* Brehm, 1822, in North Carolina. Proc. Helminthol. Soc. Wash. 36:150–152.

Holmes, J. C., and R. Podesta. 1968. The helminths of wolves and coyotes from forested regions of Alberta. Can. J. Zool. 46:1193–1204.

Jones, J., Jr. 1968. Some parasites of the common crow, *Corvus brachyhynchos* Brehm, from Ohio. Ohio J. Sci. 68:25–31.

Morgan, B. B., and E. F. Waller. 1941. Some parasites of the eastern crow (*Corvus brachyrhynchos* Brehm). Bird-Banding 12:16–22.

Pence, D. B., and W. P. Meinzer. 1979. Helminth parasitism in the coyote, *Canis latrans*, from the Rolling Plains of Texas. Int. J. Parasitol. 9:339–344.

Schell, S. C. 1953. Four new species of *Microtetrameres* (Nematoda: Spiruroidea) from North American birds. Trans. Am. Microsc. Soc. 72:227–236.

Snedecor, G. W., and W. G. Cochran. 1967. Statistical methods. Iowa State University Press, Ames. 593 pp.

Sokal, R. R., and F. J. Rohlf. 1969. Biometry. W. H. Freeman Co., San Francisco. 776 pp.

Stone, J. E., and D. B. Pence. 1978. Ecology of helminth parasitism in the bobcat from West Texas. J. Parasitol. 64:295–302.

Ward, J. W. 1935. Some parasites of crows of central Oklahoma (preliminary report). Proc. Okla. Acad. Sci. 15:65–66.