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BLOOD AND GASTROINTESTINAL PARASITES OF EASTERN WILD TURKEYS FROM KENTUCKY AND TENNESSEE

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ABSTRACT: Fifty-nine gastrointestinal tracts and 52 blood samples were collected from eastern wild turkeys (*Meleagris gallopavo silvestris* Vieillot) during the spring turkey hunts of 1979–1980 from two areas in western Kentucky and Tennessee. Eight species of parasites were recovered, and included (combined prevalence): *Haemoproteus meleagridis* Levine, 1961 (25%), *Hymenolepis carioca* (Magalhaes, 1898) (44%), *Metroliasthes lucida* Ransom, 1900 (25%), *Raillietina georgiensis* (Reid and Nugara, 1961) (15%), *R. williamsi* Fuhrmann, 1932 (64%), *Ascaridia dissimilis* Perez Vigueras, 1931 (83%), *Capillaria caudinflata* (Molin, 1858) (2%), and *Heterakis gallinarum* (Schrank, 1788) (27%). A significant difference existed between the intensities of *A. dissimilis* from the two states. Twenty-two subinoculations of collected blood were made in 1979, but no *Plasmodium* infections were recovered. Helminths of wild turkeys from 11 southeastern states were compared using similarity and diversity indices. High similarities were observed in helminth populations of two groups of states: 1) Alabama, Mississippi, Arkansas, Virginia, and Tennessee; and 2) Tennessee, Kentucky, and Illinois. Simpson's diversity index indicated helminth populations of wild turkeys in Florida were the most diverse (0.10), while those in Louisiana turkeys were the least diverse (0.33).

INTRODUCTION

Studies of helminths of wild turkeys in Kentucky and Tennessee have been limited to a single report by Maxfield et al. (1963). In that investigation, four birds from two Kentucky counties (McCreary and Pulaski), and 54 birds from four Tennessee counties (Cheatham, Cumberland, Morgan, and Shelby) were examined for helminth parasites. Blood samples were not examined for hematozoa.

Investigations concerning parasite infections of eastern wild turkeys have been well documented (Mosby and Handley, 1943; Kozicky, 1948; Maxfield et al., 1963; Prestwood, 1968; Hon et al., 1975; Prestwood et al., 1975), but only one report (Hon et al., 1975) made a concerted effort to compare helminth populations of wild turkeys from different areas.

This report presents data on helminths and hematozoa of wild turkeys from Kentucky and Tennessee, and compares prevalence data on helminths of wild turkeys from 11 southeastern states.

MATERIALS AND METHODS

Study area

Turkeys were collected from two areas in western Kentucky and Tennessee, the Tennessee Valley Authority's Land-Between-the-Lakes (LBL), and Fort Campbell, Kentucky (FTC). Both areas cross state boundaries (Fig. 1). The nucleus of the turkey flock at LBL is comprised of birds native to the area, and at one time was the only remaining flock of wild turkeys left in Kentucky. In 1973, 30 turkeys from Missouri were stocked in the Tennessee portion of LBL, and in 1981 an additional 36 birds were stocked in the northern section. The flock of turkeys at FTC is not native to the area, having been stocked from Pennsylvania. In addition, domestic turkeys have been released into the area and are now an integral part of the flock.

Sample collections

Fifty-nine gastrointestinal tracts (esophagus, proventriculus, ventriculus, small intestine, large intestine, and caeca) and 52 blood samples were collected from hunter-killed wild turkeys during the spring (gobbler only) turkey hunts of 1979–1980 at LBL and FTC. Blood samples were taken from the ventricles of the heart using a heparinized syringe, and refrigerated until subinoculation and blood smears could be

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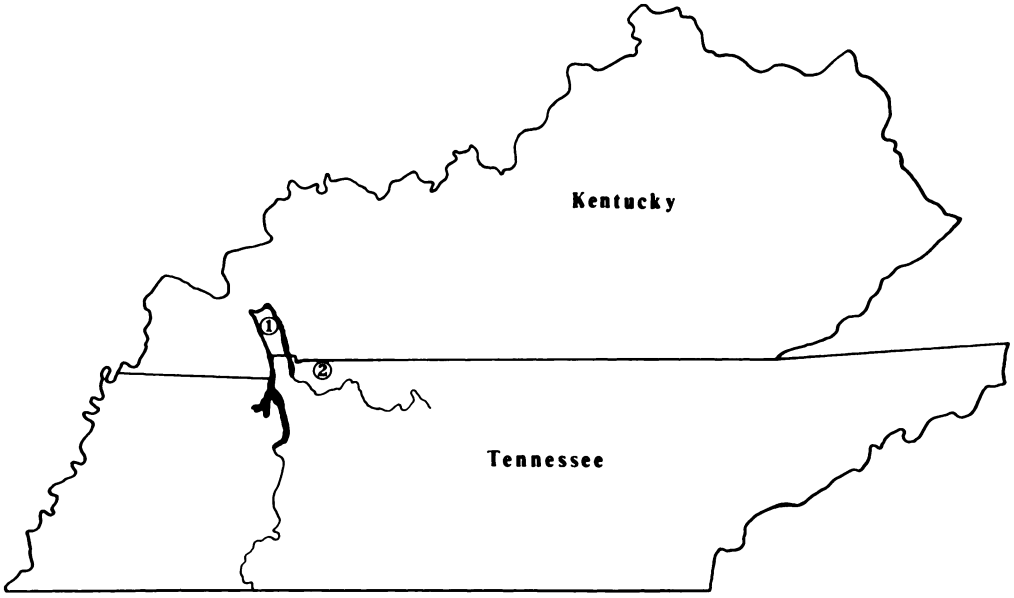

FIGURE 1. Map of Kentucky and Tennessee indicating collection sites 1) Land-Between-the-Lakes (LBL), and 2) Fort Campbell, Kentucky (FTC).

made (approximately 3–6 hr). Blood smears were stained with Giemsa's and a minimum of 20,000 erythrocytes were examined with oil immersion optics (×1,000). Remaining blood (0.5–2.0 ml) was subinoculated into the pectoral muscles of two- to five-week-old Broad-Breasted-White turkey poults (obtained from the Heart of Missouri Poultry Farm, Columbia, Missouri 65201, USA) using the technique described by Herman et al. (1966). Birds were obtained as one-day-old poults and maintained in isolation facilities throughout the course of the study. Blood smears were made from recipient birds twice weekly for 5–6 wk beginning 1 wk postinoculation.

Gastrointestinal tracts were placed in physiological saline and refrigerated for transport back to the laboratory. Helminths were collected either by direct removal or by washing intestinal contents through a 40-mesh screen. Cestodes were fixed in hot AFA and stained with Mayer's paracarmine. Nematodes were fixed in hot 70% glycerin alcohol. Representive specimens of helminths and the hemosporinid were deposited in the U.S. National Parasite Collection (Beltsville, Maryland 20705, USA) as USNM Coll. Nos. 78230–78237.

Statistical analysis

Prevalence data were analyzed using chi-square analysis of 2 × 2 contingency tables, and intensity data analyzed by ANOVA and Wilcoxon-Mann-Whitney *U*-tests. These analyses were done from statistical packages on a Hewlett-Packard HP 86 microcomputer system. Indices of diversity and similarity were computed according to Holmes and Podesta (1968). Differences were considered significant at $P < 0.05$.

RESULTS AND DISCUSSION

One hemosporinid and at least one of seven species of helminths were recovered from 25% and 97% of the samples, respectively. Prevalence and mean intensity for each species from both states are given in Table 1. All parasites recovered have been reported from wild turkeys in the southeastern USA (Gardiner and Wehr, 1949; Love et al., 1953; Maxfield et al., 1963; Goggans, 1966; Prestwood, 1968; Eve et al., 1972; Forrester et al., 1974; Hon et al., 1975; Noblet and Moore, 1975; Prestwood et al., 1975).

The one hemosporinid recovered, *Haemoproteus meleagridis*, has been recovered not only from wild turkeys across most of the southeastern USA (Love et al., 1953; Goggans, 1966; Eve et al., 1972;

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TABLE 1. Parasites recovered from 20 and 39 eastern wild turkeys from western Kentucky and Tennessee, respectively, 1979–1980.

Parasite	State[a]	Prevalence (%)	Intensity	
			Mean (±SE)	Range
Haemoproteus meleagridis	KY[b]	39	15 (7.1)	1–89
	TN[c]	18	14 (4.8)	1–77
	KY+TN[d]	25	15 (4.0)	1–89
Hymenolepis carioca	KY	45	ND[e]	ND
	TN	44	ND	ND
	KY+TN	44	ND	ND
Metroliasthes lucida	KY	25	12 (6.9)	1–39
	TN	20	19 (4.8)	3–42
	KY+TN	22	16 (4.2)	1–42
Raillietina georgiensis	KY	20	2 (1.1)	1–6
	TN	13	2 (0.5)	1–3
	KY+TN	15	2 (0.6)	1–6
Raillietina williamsi	KY	50	5 (1.5)	1–14
	TN	72	11 (2.1)	1–38
	KY+TN	64	10 (1.7)	1–38
Ascaridia dissimilis	KY	79	6 (0.9)	1–15
	TN	92	13 (3.5)	1–89
	KY+TN	83	11 (2.4)	1–89
Capillaria caudinflata	KY	ND	ND	ND
	TN	3	ND	ND
	KY+TN	2	ND	ND
Heterakis gallinarum	KY	15	56 (25.3)	1–108
	TN	33	223 (67.6)	1–806
	KY+TN	27	192 (59.3)	1–806

[a] KY = Kentucky, TN = Tennessee.
[b] $n = 18$.
[c] $n = 34$.
[d] $n = 52$.
[e] ND = not determined.

Forrester et al., 1974; Noblet and Moore, 1975), but also from Iowa (Roslein and Haugen, 1970), New York (Stone et al., 1972), and Pennsylvania (Kozicky, 1948). Prevalence of *H. meleagridis* ranged from a low of 13% in South Carolina (Noblet and Moore, 1975), to a high of 84% in Florida (Forrester et al., 1974). In our study, prevalence was low in birds from both states (Table 1), with no significant differences in either prevalence or intensity of infection. No *Plasmodium* infections were recovered from 22 subinoculations of collected blood. It is possible that IV inoculations might have allowed a better chance for recovery of latent infections than our IM inoculations.

Cestode infections were common in turkeys from both states (Table 1). The cestode most often encountered at both sites was *Raillietina williamsi*, with no significant differences in prevalence or intensity. Maxfield et al. (1963) found no birds in Kentucky infected, but 41 of 54 birds in Tennessee harbored *R. williamsi*. Prestwood et al. (1975) reported 68% of 250 adult turkeys from four southeastern states infected with *R. williamsi*, but Hon et al. (1975) found none of 220 turkeys infected in Florida.

Specimens of a second species of *Raillietina*, *R. georgiensis*, and *Metroliasthes lucida* were recovered infrequently from either state, with no significant difference

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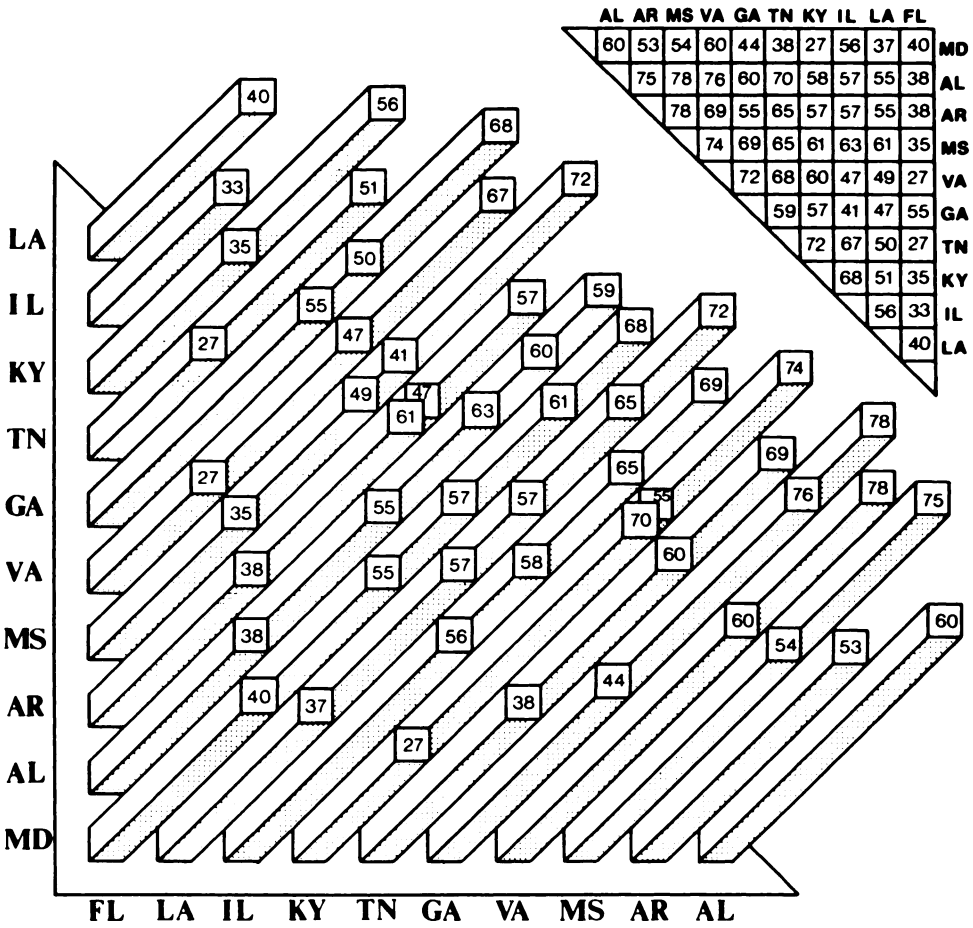

FIGURE 2. Diagram of indices of similarity for helminth populations of wild turkeys from 11 southeastern states. AL = Alabama; AR = Arkansas; FL = Florida; GA = Georgia; IL = Illinois; KY = Kentucky; LA = Louisiana; MD = Maryland; MS = Mississippi; TN = Tennessee; VA = Virginia.

between prevalence or intensities for either parasite. These findings are similar to other reports of *R. georgiensis*, but Maxfield et al. (1963), Prestwood (1968), Hon et al. (1975), and Prestwood et al. (1975) indicated *M. lucida* was one of the most common cestodes in southeastern wild turkeys.

A small hymenolepid, *Hymenolepis carioca*, was collected from the anterior small intestine of over 40% of the birds from either state (Table 1), but exact numbers could not be ascertained because of the loss of scoleces. Studies already mentioned have reported *H. carioca* infrequently from wild turkeys.

Prevalence of *Ascaridia dissimilis* in turkeys from both states was similar, but turkeys from Tennessee had a significantly greater mean intensity than birds from Kentucky. This difference could be due to the introduction of domestic turkeys into Fort Campbell, where most of the heavily parasitized turkeys were located. Prestwood et al. (1975) reported *A. dissimilis* as the most common nematode encountered in their study, and Maxfield et al. (1963) recovered this nematode from 50%

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TABLE 2. Major helminths of wild turkeys from 11 southeastern states.

	FL[a]	GA	TN	AL	VA	AR	MS	MD	KY	IL	LA
Sample size	267	9	93	104	38	144	156	9	24	68	21
Simpson's index	0.10	0.12	0.15	0.17	0.17	0.19	0.19	0.21	0.22	0.23	0.33
% Hosts infected with:											
Ascaridia dissimilis	26	67	84	57	76	89	91	44	83	48	71
Heterakis gallinarum	13	55	42	76	95	79	95	100	17	13	48
Raillietina williamsi	4	11	74	54	37	37	55	11	41	41	0
Metroliasthes lucida	56	33	37	26	16	53	51	0	29	28	95
Raillietina ransomi	10	44	1	17	39	6	30	22	0	0	0
Hymenolepis carioca	1	22	35	2	31	3	1	0	46	0	0
Echinoparyphium recurvatum	9	0	3	13	0	8	0	0	0	0	9
Brachylaima virginianum	1	0	1	10	5	1	0	11	0	0	0
Cotylurus flabelliformis	1	0	10	3	3	1	1	0	0	0[b]	1

[a] FL = Florida; GA = Georgia; TN = Tennessee; AL = Alabama; VA = Virginia; AR = Arkansas; MS = Mississippi; MD = Maryland; KY = Kentucky; IL = Illinois; LA = Louisiana.

[b] Jackson et al. (1977)—*Cotylurus* sp. 3%.

of Kentucky birds and 87% of Tennessee birds.

Specimens of *Heterakis gallinarum* were recovered from turkeys in both states, but with a low prevalence when compared to other southeastern states. Prestwood et al. (1975) reported this parasite as one of the two most common nematodes parasitizing wild turkeys in the southeast. Hon et al. (1975) recovered *H. gallinarum* only from 5% of turkeys in their study, and found *Strongyloides* sp. as the dominant nematode. Maxfield et al. (1963) found only one of four birds in Kentucky and 26 of 54 birds in Tennessee infected with *H. gallinarum*. This parasite is potentially important in wild turkey populations because it is the vector of *Histomonas meleagridis*, the etiologic agent of infectious enterohepatitis. There have been many instances of problems with this disease in southeastern wild turkeys (Stoddard, 1935; Craig and Barkalow, 1950; Bailey and Rinell, 1967; Kellogg and Reid, 1970).

One specimen of *Capillaria caudinflata* was recovered from the caecum of one bird from Tennessee and probably was an accidental parasite, but several other *Capillaria* species have been reported from wild turkeys (Maxfield et al., 1963; Prestwood, 1968; Hon et al., 1975; Prestwood et al., 1975).

Indices of similarity (Holmes and Podesta, 1968) were computed for helminth populations in wild turkeys from southeastern states and compared on a state-to-state basis. Data used included the work of Maxfield et al. (1963), Prestwood (1968), Hon et al. (1975) and Jackson et al. (1977), as well as data from our study. The study by Jackson et al. (1977), done in southern Illinois, was included because of the close proximity to our study areas. Data of Prestwood et al. (1975) were not included because prevalence by state was not given.

Figure 2 illustrates that helminth populations from wild turkeys in two separate groups of states were fairly similar: 1) Alabama, Arkansas, Mississippi, Tennessee, and Virginia; and 2) Illinois, Kentucky, and Tennessee. Florida was the least similar to all states except for Georgia. Rea-

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sons for this similarity with Georgia and for the lack of similarity with other states could have been due to: 1) the unique host involved, *M. g. osceola* Scott; 2) the habitat; or 3) a combination of host and habitat. Williams (1981) indicates that the Florida subspecies and eastern subspecies intergrade across the southern and southeastern parts of Georgia, which could be responsible for the similarity of the two states.

Simpson's diversity index was calculated for helminth populations of turkeys from each state (Table 2). Turkeys from Florida had the most diverse helminth fauna (0.10) followed closely by Georgia (0.12), yet with no real dominance by any parasite species. Turkeys from Louisiana showed the least diverse helminth population (0.33) which is a result of only five species recovered from 21 turkeys, and greatly dominated by *M. lucida* and *A. dissimilis* according to Maxfield et al. (1963). These data also indicated that the majority of wild turkeys in the southeast had quite diverse helminth populations, although the majority of species components of the total helminth faunas was similar.

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LITERATURE CITED

BAILEY, R. W., AND K. T. RINELL. 1967. Management of the eastern turkey in the northern hardwoods. *In* The Wild Turkey and Its Management, O. H. Hewitt (ed.). The Wildlife Society, Washington, D.C., pp. 261–302.

CRAIG, F. R., AND F. S. BARKALOW. 1950. Blackhead in wild turkey on free range in North Carolina. Wildl. N. Carolina 14: 18–19.

EVE, J. H., F. E. KELLOGG, AND F. A. HAYES. 1972. Blood parasitism in wild turkeys in the southeastern United States. J. Am. Vet. Med. Assoc. 161: 638–640.

FORRESTER, D. J., L. T. HON, L. E. WILLIAMS, JR., AND D. H. AUSTIN. 1974. Blood protozoa of wild turkeys in Florida. J. Protozool. 21: 494–497.

GARDINER, J. L., AND E. E. WEHR. 1949. Some parasites of the wild turkeys (*Meleagridis* [sic] *gallopavo silvestris*) in Maryland. Proc. Helminthol. Soc. Wash. 16: 16–19.

GOGGANS, J. G. 1966. A survey of blood parasites in the wild turkey of Alabama. M.S. Thesis. University of Auburn, Auburn, Alabama, 46 pp.

HERMAN, C. M., J. O. KNISLEY, JR., AND E. L. SNYDER. 1966. Subinoculation as a technique in the diagnosis of avian *Plasmodium*. Avian Dis. 10: 541–547.

HOLMES, J. C., AND R. PODESTA. 1968. The helminths of wolves and coyotes from the forested regions of Alberta. Can. J. Zool. 46: 1193–1204.

HON, L. T., D. J. FORRESTER, AND L. E. WILLIAMS, JR. 1975. Helminths of wild turkeys in Florida. Proc. Helminthol. Soc. Wash. 42: 119–127.

JACKSON, J. W., R. D. ANDREWS, AND B. T. RIDGEWAY. 1977. Helminth parasites from Illinois wild turkeys. Trans. Ill. State Acad. Sci. 69: 455–460.

KELLOGG, F. E., AND W. M. REID. 1970. Bobwhites as possible reservoir hosts for blackhead in wild turkeys. J. Wildl. Manage. 34: 155–159.

KOZICKY, E. L. 1948. Some protozoan parasites of the eastern wild turkey in Pennsylvania. J. Wildl. Manage. 12: 263–266.

LOVE, G. J., S. A. WILKIN, AND M. H. GOODWIN. 1953. Incidence of blood parasites in birds collected in southwestern Georgia. J. Parasitol. 39: 53–57.

MAXFIELD, B. G., W. M. REID, AND F. A. HAYES. 1963. Gastrointestinal helminths from turkeys collected in southeastern United States. J. Wildl. Manage. 27: 261–271.

MOSBY, H. S., AND C. O. HANDLEY. 1943. The Wild Turkey in Virginia: Its Status, Life History, and Management. Virginia Comm. Game and Inland Fisheries, Richmond, Virginia, 281 pp.

NOBLET, R., AND H. S. MOORE. 1975. Prevalence and distribution of *Leucocytozoon smithi* and *Haemoproteus meleagridis* in wild turkeys in South Carolina. J. Wildl. Dis. 11: 516–518.

PRESTWOOD, A. K. 1968. Parasitism among wild turkeys (*Meleagris gallopavo silvestris*) of the Mississippi delta. Ph.D. Thesis. University of Georgia, Athens, Georgia, 67 pp.

———, F. E. KELLOGG, AND G. L. DOSTER. 1975. Parasitism among wild turkeys in the southeast. *In* Proc. 3rd Nat. Wild Turkey Symp., pp. 27–32.

ROSLIEN, D. J., AND A. O. HAUGEN. 1970. Some blood parasite and disease antibody findings in wild Rio Grande turkeys stocked in Iowa. Proc. Iowa Acad. Sci. 77: 93–96.

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STODDARD, H. L. 1935. Wild turkey management. Trans. Am. Game Conf. 21: 326–333.

STONE, W. B., L. W. DEGRAFF, S. W. EATON, AND B. L. WEBER. 1972. Blood parasites of wild turkeys in New York. N.Y. Fish Game J. 19: 116–122.

WILLIAMS, L. E., JR. 1981. The Book of the Wild Turkey. Winchester Press, Tulsa, Oklahoma, 181 pp.

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