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Helminth Parasites of Illinois Wild Turkeys

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Helminth Parasites of Illinois Wild Turkeys

(TITLE)

BY

James W. Jackson

THESIS

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HELMINTH PARASITES OF ILLINOIS WILD TURKEYS

by

JAMES W. JACKSON

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HELMINTH PARASITES OF ILLINOIS WILD TURKEYS

James W. Jackson

Abstract: Viscera from 69 wild turkeys (Meleagris gallopavo silvestris) collected from Jackson, Union and Alexander counties, Illinois, were examined for helminth and coccidian parasites. A total of eight species of parasites was found, all in the alimentary tract. The coccidian parasite Eimeria sp. was found in 9.6% of birds examined. The nematodes Heterakis gallinarum, Ascaridia galli and Ascaridia dissimilis were found in 13.2%, 27.9% and 48.5% respectively of all birds examined. Three species of cestodes, Raillietina williamsi, Metroliasthes lucida and Hymenolepis sp., were recovered from 41.1%, 27.9% and 1.4% respectively of birds examined. One species of trematode, possibly of the genus Cotylurus, was recovered from 2.9% of the birds. Infection rates of Eimeria sp. and Ascaridia galli were higher in juveniles than in adults. Heterakis gallinarum may be related to turkey mortality since it is responsible for transmitting the protozoan Histomonas meleagridis, the causative organism of blackhead disease in turkeys.

Management of the wild turkey (Meleagris gallopavo silvestris) population in Illinois is dependent, in part, on understanding the role of parasitism as a limiting factor in

these game birds. Wild turkeys have been reestablished at densities sufficient to support hunting in Illinois only since 1970; as a result, little is known of their parasites. Surveys of parasites in wild turkeys have been made in several southeastern states by Prestwood (1968), Maxfield et al. (1963) and others. These studies have been concerned with the kinds of parasites found, and their geographical distribution. Little work has been done to determine the pathogenic effects parasites have on wild birds in their natural habitat. Studies have shown, however, that in the southeastern United States parasitism and disease may be responsible for a large proportion of the 50 to 65 percent annual mortality rate not attributed to a hunting season (Prestwood, Kellogg and Doster 1973). This report is a survey of parasites found in Illinois turkeys which must be preliminary to studies of the pathogenic effects these parasites might have on their host.

This study was supported, in part, by the Illinois Department on Conservation Federal Aid in Wildlife Restoration Project W-63-R. R. D. Andrews and Dr. B. T. Ridgeway assisted with field and laboratory work on this project. Ralph Lichtenfelds of the U.S.D.A. Animal Parasitology Institute confirmed identification of the parasites found, and G. T. Riegel, W. J. Keppler and V. B. Kniskern edited this thesis.

MATERIALS AND METHODS

Viscera of 69 male wild turkeys were collected at check stations maintained by the Illinois Department of Conservation during the spring hunting seasons in 1972 and 1973. All birds brought to the check stations had been killed in the southern Illinois counties of Alexander, Jackson and Union. The age, weight and location of kill were recorded for each bird.

Viscera collected were examined immediately for parasites. The alimentary canals were opened with scissors and the contents flushed with water into white enamel pans and examined for parasites. Hearts and livers were opened with scissors and the interior examined for parasites. Cestodes and nematodes were placed in labeled vials of a standard solution of A.F.A. Fecal samples (1973 only) were collected from the lower alimentary region. Two grams of feces was placed in approximately 50 ml. of 2.5% potassium dichromate solution in labeled 1-pint plastic jars. The lids of the jars were not tightened so that sporulating oocysts present would be allowed air. Trematodes were fixed in a flat position in the same manner described by Prestwood (1968). Later they were transferred to 30%, 50%, 70% and 100% ethyl alcohol in sequence, so as not to be damaged by the rapid diffusion of water out of the parasite.

Several representatives of each species of helminth parasites found were given to Dr. Ralph Lichtenfelds of

the United States Department of Agriculture, Animal Parasitology Institute, for confirmation. Nematodes were cleared with lacto-phenol between 1x3 inch glass slides and identified (Levine 1968). Scolices and proglottids of representative cestodes were stained with hematoxylin, cleared in oil of wintergreen and mounted on permanent 1x3 inch glass slides using Permount mounting medium. Identification of the cestodes was based on Williams (1931), Wardle and McLeod (1952) and Yamaguti (1959). Trematodes were stained with acetocarmine, cleared in oil of wintergreen and mounted on 1x3 inch glass slides using Permount mounting medium. Trematodes were then identified using Yamaguti (1961). Fecal samples were kept for two weeks after collection at room temperature with allowance for air. Oocysts were then isolated by using a modified sugar floatation method (Cable 1940). Oocyst examination was made with a microscope with a magnification of 450 diameters. All oocysts found were photographed for identification (Davies, Joyner and Kendall 1963) under this magnification.

RESULTS

A total of eight species of parasites was found in the lower alimentary tract of 69 Illinois wild turkeys examined in 1972 and 1973. No parasites were found in the esophagus, heart, liver or crop. Oocysts of the coccidian protozoan Eimeria sp. were recovered in fecal samples from 3 of 31 wild turkeys (Table 1). Juvenile birds showed a higher rate

of infection with Eimeria sp. than did adult birds (Table 2). This parasite was found in turkeys from all three counties included in the study.

Three species of nematodes were recovered from Illinois wild turkeys (Table 1). Heterakis gallinarum was removed from the ceca of 9 out of 68 wild turkeys. A range of 1 to 13 adult parasites was found in the birds with a mean of 6.6. In two birds, approximately 50 juvenile forms of H. gallinarum were found. The rate of infection in adult and juvenile birds was essentially the same (Table 2). H. gallinarum infections were found in all counties included in the study. Ascaridia galli was found in 19 out of 68 wild turkeys. Birds infected with A. galli harbored from 1 to 46 worms, with an average of 6.9. Juveniles had higher infection rates than adults (Table 2). A. galli infections occurred more frequently in birds from Alexander County than in birds from Jackson or Union counties (Table 2). Ascaridia dissimilis was found in the intestines of 33 of 68 wild turkeys. A mean of 11.2 worms per infected bird was found, with a range of 1 to 40 parasites per bird. This parasite infected adults at a slightly higher rate than juveniles (Table 2). Birds from Alexander County were parasitized with A. dissimilis more frequently than those birds from Jackson or Union counties (Table 1).

Three species of cestodes were found infecting Illinois wild turkeys. Raillietina williamsi and Metroliasthes lucida occurred frequently, 41% and 27.9% respectively, in the intes-

Table 1. Gastrointestinal parasites from wild turkeys shot in southern Illinois in 1972 and 1973.

Parasite	Alexander County		Jackson County		Union County		Total	
	No. Examined	% Positive	No. Examined	% Positive	No. Examined	% Positive	No. Examined	% Positive
Protozoan								
Eimeria sp.	10	20.0	9	11.1	12	8.3	31	9.6
Nematode								
Heterakis gallinarum	22	13.6	21	14.3	25	12.0	68	13.2
Ascaridia galli	22	40.9	21	23.8	25	20.0	68	27.9
Ascaridia dissimilis	22	63.6	21	52.3	25	32.0	68	48.5
Cestode								
Raillietina williamsi	22	77.3	21	9.5	25	36.0	68	41.1
Metroliasthes lucida	22	18.1	21	14.3	25	48.0	68	27.9
Hymenolepis sp.	22	4.5	21	--	25	--	68	1.4
Trematode								
Cotylurus sp.	22	--	21	9.5	25	--	68	2.9

Table 2. Percentage of adult and juvenile turkeys infected with gastrointestinal parasites in 1972 and 1973.

Parasite	Adults		Juveniles	
	No. Infected	% Positive	No. Infected	% Positive
Protozoan				
Eimeria sp.	1	4.5	2	22.2
Nematode				
Heterakis gallinarum	6	13.0	3	13.6
Ascaridia galli	11	23.9	8	36.3
Ascaridia dissimilis	23	50.0	10	45.5
Cestode				
Raillietina williamsi	18	39.1	10	45.4
Metroliasthes lucida	14	30.4	5	22.7
Hymenolepis sp.	1	2.1	--	---
Trematode				
Cotylurus sp.	2	4.3	--	---

tines of wild turkeys. In some cases, combined infections were so heavy, 50 adult worms, that the intestinal lumen appeared to be blocked. Several specimens of a third type of cestode, Hymenolepis sp., were found in a single adult turkey from Alexander County. Accurate counts of cestodes were not made because of the tendency of the worms to break easily into many parts and the loss of scolices when the worms were removed from the birds' intestines. Juvenile birds showed a higher infection rate with R. williamsi while adults showed a higher rate of infection with M. lucida (Table 2).

Trematodes of the family Strigeidae, possibly the genus Cotylurus, were recovered from the intestine of a single adult turkey from Jackson County in 1972 and 1973. The staining technique used gave poor results and it was impossible to determine the genus of the trematode without question. The range of infection was 7 to 10 parasites per bird with a mean of 8.5.

DISCUSSION

Illinois wild turkeys (M. gallopavo silvestris), were found to have a lower percentage of parasitic infections than reported for turkeys in other areas of the United States (Table 3). A reason for this may be that Illinois turkeys are well dispersed and densities are lower than other populations studied. Because of the birds' dispersion, the chance of food and water contamination by parasite ova passed in the

Table 3. Percentage of parasite infections and number of various parasites found in Illinois wild turkeys as compared with investigations in other areas.

Area	Birds Examined	Types of Parasites Found	Heterakis gallinarum	Ascaridia galli	Ascaridia dissimilis	Cotylurus sp.	Raillietina williamsi	Metroliasthes lucida	Hymenolepis sp.	Eimeria sp.
Illinois	69	8	13.2	27.9	48.5	2.9	41.1	27.9	1.4	10.0
Southeastern U.S. (Maxfield et al. 1963)	390	25	62.3	1.5	66.2	4.4	39.0	43.1	0.0	
Mississippi Delta Region (Prestwood 1968)	216	41*	97.0	0.0	96.0	1.0	50.0	55.0	0.0	46.7**
Southeastern U.S. (Prestwood et al. 1971)	321									17.0

*including parasitic arthropods

**only juveniles examined

feces may be less. The chance of intermediate hosts of some parasites becoming infected is also less. Other reasons for lower infections in Illinois birds may be due to climate and topography differences in the study areas, and differences in parasite collection techniques used in the various studies. Furthermore, reservoir hosts in other parts of the turkey's range may be absent or at lower densities in southern Illinois. Ascaridia galli was the only parasite found significantly more frequently in Illinois birds than in birds of other areas. This nematode is very common in domestic chickens and turkeys, and a high incidence of this parasite in wild turkeys could be related to domestic fowl contaminating parts of the turkey range with ova passed in feces.

The total number of species of internal parasites found was less in Illinois wild turkeys than in wild turkeys from other areas. It was possible to obtain only 69 birds for examination over a two year period in Illinois. A larger sample of turkeys would probably result in a greater variety of intestinal parasites found, but the overall incidence of parasitism would remain nearly the same. The difference in the number of species found could also be due to variations in the climate and topography of the different areas, and to the fact that Illinois birds are well dispersed. Further investigation is needed to determine how population density, climate and topography affect the variety of parasitic forms a turkey population might harbor.

Parasite infections were similar in turkeys from the

three Illinois counties except for the trematodes found in Jackson County and the single Hymenolepis sp. found in Alexander County. The three counties are adjacent and the turkey population is essentially continuous across them. Differences in parasites in the birds are expected to be slight. Minimal differences may exist due to local habitat variation, but if a greater number of turkeys were examined, the trematode and the cestode Hymenolepis sp. would probably be found to be more uniformly distributed than as shown in this study.

Cecal infections with Heterakis gallinarum totaled 13.2% of Illinois turkeys. This was a much lower rate than reported by Maxfield (62%) in 1963 and Prestwood (97%) in 1968. This parasite is important because the protozoan Histomonas meleagridis, which causes blackhead disease in turkeys, may be transmitted from bird to bird through the ingested ova of this nematode (Prestwood, Kellogg and Doster 1973). Blackhead could cause high mortality in the Illinois wild turkey population even though H. gallinarum infection rates are comparatively low, since the domestic chicken and bobwhite quail, common carriers of blackhead disease, share parts of the turkey range. Hopefully, the dispersion and the low density of Illinois turkeys is such that this potential danger will not become a serious mortality factor. The pathogenicity of the other helminths found is relatively unknown. Some species in large numbers reduce the general condition of the turkey and cause some weight loss (Wehr 1952), but are not considered a threat to the turkey population.

Ascaridia galli was found in 27.9% of wild turkeys in Illinois. This is an unusually high rate of infection of wild turkeys for this particular parasite as compared to studies made in other areas by Maxfield (1963) and Prestwood (1968). Considering the size of the parasite and that some birds were infected with as many as 46 adult worms in the intestine, this parasite could seriously reduce the condition of its host. A. dissimilis seemed to be the most common nematode parasite of Illinois wild turkeys. As many as 40 adult nematodes of this species were found in infected birds. Studies in other areas indicate high incidence of this nematode in wild turkeys (Prestwood, Kellogg and Doster 1973). The pathogenicity of this parasite in Illinois wild turkeys is not known; however, it is smaller than A. galli and probably does not cause serious problems. Heavy turkey infections with Raillietina williamsi and Metroliasthes lucida were encountered. These parasites could be important if turkeys were stressed by severe weather or other factors. Coccidian infections affect poults more severely than adults, and deaths of pen-raised poults caused by coccidian infections have been reported (Kozicky 1948). The effect of coccidiosis on wild turkeys in the natural state is unknown but the birds' dispersion would reduce the birds' chances of ingesting oocysts.

Juvenile birds in this study, as in others, have higher infection rates than adults for most parasites. Juveniles may host more parasites because they are confined to a brood as poults, which would enhance the spread of some parasitic

infections among them (Prestwood, Kellogg and Doster 1971). In addition, adult birds may have developed immunity to parasitic infections. A total of 321 adult and juvenile wild turkeys examined by Prestwood, Kellogg and Doster (1973) showed 50% of 123 juveniles infected with Eimeria as compared to 17% of 198 adult birds, and Eimeria was found in 46.7% of juveniles examined in Mississippi (Prestwood 1968). Metroliasthes lucida, however, was found more frequently in adult birds than juveniles. Also the trematodes found and the only Hymenolepis sp. infections were from adult turkeys. In this study 47% more adults were examined for parasties than juveniles. If more juveniles had been examined, possibly Hymenolepis sp. and the trematodes would have been found in the juveniles also.

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LITERATURE REVIEW

The eastern wild turkey (Meleagris gallopavo silvestris), once abundant in Illinois, had disappeared from the state at the turn of the century. In the 1950's the Illinois Department of Conservation began efforts to restock the birds in the Shawnee National Forest in southern Illinois. The wild turkey population was estimated at 500 in 1963 (Aldrich 1967), and in 1970 the population was sufficient to support a limited spring male-only hunting season in three counties.

Studies on this population of Illinois birds are few, and no studies dealing with their parasites have been made. The effective management of this game bird in Illinois is dependent, in part, on understanding the role of parasitism as a limiting factor. This report investigates the kinds of coccidian and internal helminth parasites found in the Illinois wild turkeys. Studies of wild turkey parasites have been made in the southern and eastern United States by Prestwood (1968), Maxfield et al. (1963), Kozicky (1948), and others.

Coccidia

A total of six species of the coccidian genus Eimeria have been recorded as infecting the wild turkey in the

United States. Prestwood (1968) listed E. adenoeides, E. gallopavonis, E. meleagridis, E. meleagrimitis and E. subrotunda as infecting the eastern wild turkey, M. gallopavo silvestris, in the Mississippi Delta region. E. meleagridis oocysts were found in 40% of 95 wild turkey droppings collected from Pennsylvania turkeys (Kozicky 1948). E. adenoeides, E. dispersa, E. gallopavonis, E. meleagridis, E. meleagrimitis and E. subrotunda were found in wild turkey poults, juveniles, and adults from Alabama, Arkansas, Mississippi, and West Virginia (Prestwood, Kellogg and Doster 1971).

Wild turkey mortality rates resulting from natural coccidian infections are not known. E. adenoeides, E. gallopavonis and E. meleagrimitis have been listed as the most pathogenic species of coccidia in domestic turkeys (Prestwood et al. 1971). Infections of coccidia seem to be more severe in poults. Prestwood et al. (1971) found 50% of 123 poults infected with coccidian parasites as compared to 17% infection in 198 adult and juvenile birds. Natural infections of wild turkeys do not reach high levels of parasitemia because the chance of ingesting oocysts is low due to the birds' dispersion. In overcrowded situations, such as feeding sites or baited trapping areas, high poult mortality might be expected from coccidian infections. Where baited traps and feeders are used, it has been suggested that periodic rotations of these sites should be made (Prestwood et al. 1973).

E. dispersa, the most commonly found species in wild turkeys (Prestwood et al. 1971), also parasitizes the

bobwhite quail (Colinus virginianus). The Hungarian partridge (Perdix perdix) has experimentally been infected with E. dispersa, and is known to host E. gallopavonis also. The six species of Eimeria mentioned parasitize domestic turkeys in the United States.

Cestodes

Cestodes have little pathogenic effect in the wild turkey. Other than occasional intestinal blockage by multiple infections of large tapeworms and some energy loss, most of these flatworms do little damage to their host. Prestwood et al. (1973) listed 11 species of cestodes parasitizing the intestine of wild turkeys in the United States.

Amoebotaenia cuneata was found infecting wild turkeys from the Mississippi Delta (Prestwood 1968), and is considered a common cestode of poultry in the United States. The intermediate host is the earthworm. Damage caused by the adult parasite is comparatively slight, but deaths in poultry have been attributed to A. cuneata (Wehr 1952).

Davainea meleagridis has been reported in wild turkeys by Gardiner and Wehr (1949), Maxfield et al. (1963) and Prestwood and Reid (1966). Its effect on the wild turkey is not known.

Hymenolepis carioca, a common tapeworm in domestic turkeys and chickens, has been reported by Maxfield et al. (1963) in wild turkeys in southeastern United States. The

parasite's intermediate hosts are dung beetles, flower beetles and stable flies (Wehr 1952).

Metroliasthes lucida is probably the most frequently found cestode parasitizing the wild turkey. Infection rates of 43%, 60% and 55% of all birds examined were reported by Maxfield et al. (1963), Self and Bouchard (1950) and Prestwood (1968) respectively. Williams (1931) also mentioned M. lucida as a parasite of wild turkeys. Guinea fowl have been experimentally infected with M. lucida cysticercoids from grasshoppers. Wehr (1952) indicates that growth rates of infected birds may be reduced somewhat, and that irritation and degeneration of villi may occur at the attachment point of the scolex.

Raillietina cesticillus, found commonly in domestic turkeys, chickens, guinea fowl and quail, has also been reported in wild turkeys (Gardiner and Wehr 1949). Infections are transmitted by the ingestion of houseflies and various ground and dung beetles. Some growth reduction and villi inflammation are associated with heavy infections (Wehr 1952).

R. georgiensis is occasionally found in wild turkeys, and has been reported by Maxfield et al. (1963) and Prestwood (1968).

R. ransomi was listed as parasitizing wild turkeys by Williams (1931), Wehr and Coburn (1943), Maxfield et al. (1963) and Prestwood (1968). This cestode was found in 23% of the wild turkeys examined by Prestwood (1968) and 13% of

those examined by Maxfield (1963). The life history of R. ransomi in the wild turkey is unknown.

R. williamsi is the second most commonly found cestode of the wild turkey. R. williamsi was reported in 50% of the birds examined by Prestwood (1968) and 39% of those examined by Maxfield et al. (1963). Other reports of this cestode in wild turkeys have been made by Williams (1931), Gardiner and Wehr (1949) and Wehr and Coburn (1943). The life history of R. williamsi in the wild turkey is not known.

R. sp., possibly a new species of the genus Raillietina, was found in wild turkeys by Mosby and Handley (1943).

Trematodes

Wild turkeys in the United States are known to host 11 species of trematodes (Prestwood et al. 1973). Trematodes seem to occur in too low of incidence in wild turkeys to cause severe problems. Athesmia heterolecithodes and Renicola sp. are the most common flukes of wild turkeys (Prestwood et al. 1973). A. heterolecithodes has been reported infecting the bile duct and gall bladder of wild turkeys from Alabama and West Virginia (Byrd et al. 1967). A. heterolecithodes has also been reported from ruffed grouse, sharp-tailed grouse, clapper rails, king rails and some species of mammals.

Brachylaema virginiana was originally found in the intestine of the opossum (Didelphis marsupialis). This

trematode has been reported from wild turkeys in the southeastern United States (Maxfield et al. 1963). The effect of this parasite on its host is unknown.

Cotylurus flabelliformis was originally described from the small intestine of wild ducks, but two reports of this trematode in wild turkeys have been made (Maxfield et al. 1963, Prestwood 1968). The intermediate hosts of this trematode are snails of the genera Helisoma, Planorbula, Stagnicola, Lymnea and Physa. The effect of this parasite in the wild turkey is not known.

Echinoparyphium recurvatum has been found infecting the small intestine of wild turkeys by Self and Bouchard (1950), Maxfield et al. (1963) and Prestwood (1968). Severe inflammation of the intestinal mucosa and death was observed in domestic turkey poults with large infections (Annereaux 1940). Larval stages of E. recurvatum develop in fresh water snails (Lymnea, Planorbula and Viviparus). The cercariae encyst in snails and tadpoles. Infections in wild ducks, chickens and grebes have been reported (Price 1952).

Leucochloridium sp., infecting the ceca and intestine of wild turkeys, especially poults, was reported by Prestwood (1968). This trematode uses the snail genus Succinea as an intermediate host and also infects several genera of shore birds.

Psilotornus audacirrus was found in the ceca and intestine of a single wild turkey from Alabama (Byrd and Prest-

wood 1969). Its pathogenic effect in wild turkeys is unknown.

Prosthogonimus ovatus was found by Prestwood (1968) in a single wild turkey (M. gallopavo silvestris) from the Mississippi Delta region. The parasite was found in the bursa and oviduct of the host. P. macrorchis has been known to parasitize the ovaduct of domestic fowl and cause abnormalities in egg production (Price 1952).

Renicola hayesannieae was reported infecting the kidneys of wild turkeys from Mississippi (Byrd and Kellogg 1972). The life history of R. hayesannieae is not known, but the snails of the genus Succinea are suspected as the intermediate host. The pathogenic effect of this trematode on wild turkeys is also unknown.

Rhopalias macracanthus, a fluke described from the opossum (Didelphis marsupialis), was found in the intestine of a single wild turkey from Georgia (McKeever 1961). The parasite was slightly smaller than those described from an opossum, and thought to be a facultative parasite.

Tanaisia zarudnyi has been found to have only a slight pathogenic effect on its host. This fluke was found in the kidney of a single wild turkey from the Mississippi Delta region (Prestwood 1968).

Zygocotyle lunata has been reported from the intestine of wild turkeys by Self and Bouchard (1950) and Maxfield et al. (1963). Price (1952) stated that Z. lunata has been found in the goose and has experimentally infected wild ducks. The intermediate host of this parasite is the

snail Heliosoma antrosa. The fluke does not produce serious damage to its avian host.

Acanthocephala

The acanthocephala are found rarely in wild turkeys (Prestwood et al. 1973). Huggins and Dauman (1961) found three specimens of Mediorhynchus grandis in a single Merriam's wild turkey in South Dakota. This is thought to be the first record of an acanthocephala found in a natural infection in wild turkeys in North America. Prestwood (1968) later found 20 of 216 eastern wild turkeys from Arkansas and Mississippi to be infected with Mediorhynchus sp. The pathogenicity of M. grandis in wild turkeys is not known.

Nematodes

Prestwood et al. (1973) reported 17 parasitic nematodes in wild turkeys from the United States. Mississippi Delta wild turkeys (M. gallopavo silvestris) are known to host 12 species of nematodes (Prestwood 1968). Prestwood found Ascaridia dissimilis in 96% and Heterakis gallinarum in 97% of 216 wild turkeys examined. Strongyloides sp. was found in 60% and Capillaria caudinflata and C. contorta were found in 47% of the birds. Other species found were C. obsignata, Dispharynx nasuta, Heterakis sp., Oxyspirura sp., Seurocyrnea sp., Syngamus trachea and Trichostrongylus tenuis. The percentage of infection of these roundworms was considerably lower. Roundworm parasites that required an inter-

mediate host in their life cycles did not occur as frequently in turkeys as those parasites that did not require an intermediate host. Variations of H. gallinarum and Ascaridia dissimilis infections in turkeys found in different age groups, areas and seasons were found to be statistically significant. These variations were attributed to exposure to contaminated environments, amount of rainfall, availability of food, and density of the wild turkey population.

Maxfield et al. (1963) found 12 species of roundworms in turkeys from the southeastern United States. Of 390 birds examined, A. dissimilis and H. gallinarum were found most frequently, 66.2% and 62.3% infections respectively. Other species of nematodes found were A. galli, C. annulata, C. bursata, C. obsignata, Gongylonema ingluvicola, Seurocyrnea colini, Seurocyrnea sp., Strongyloides avium, Strongyloides sp. and T. tenuis.

Gardiner and Wehr (1949) listed three nematode parasites as infecting Maryland wild turkeys: T. tenuis, A. dissimilis and C. longicollis.

Anderson and Prestwood (1969) reported Singhfilaria hayesi from wild turkeys of southeastern United States, and Wehr and Coburn (1943) reported Cheilospirura sp. from the gizzard of wild turkeys.

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