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Preliminary Studies On Parasites of Upland Game Birds And Fur-Bearing Mammals in Illinois

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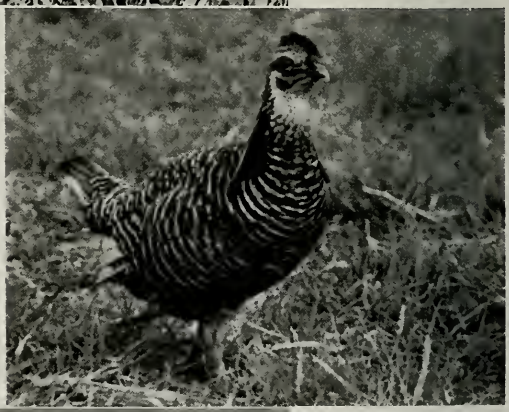
Young of the ring-necked pheasant, a desirable upland game bird important in Illinois.



Adult male of the prairie chicken, an upland game bird once common in the state.

Adult of the muskrat, most numerous and valuable of the Illinois fur-bearers.

ILLINOIS NATURAL HISTORY SURVEY BULLETIN
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Preliminary Studies On Parasites of Upland Game Birds And Fur-Bearing Mammals in Illinois

W. HENRY LEIGH

THE following is a brief report on studies of the parasites of Illinois upland game birds and fur-bearing mammals. It was undertaken by the author during graduate study at the University of Illinois as a project of the Section of Game Research and Management of the Illinois Natural History Survey.

Because it was not possible to continue the study following completion of graduate work, it has seemed advisable to present what has been learned in a preliminary way about the parasite fauna of such important upland game birds as the prairie chicken, pheasant and quail, and of such fur-bearers as the raccoon, muskrat, opossum, red fox, skunk and mink.

While it obviously is not to be regarded as giving a satisfactory picture of host-parasite relations of the animals mentioned, the information embodied by this paper constitutes most of that available concerning these relationships in Illinois, and is to be viewed only as an explorative attempt to evaluate the possibilities for further productive and more intensive work to determine what part parasites play in the economy of nature as it concerns these animals in Illinois.

Sincere appreciation is extended to all those who assisted in this work, especially to Dr. R. E. Yeatter and Dr. D. H. Thompson of the Illinois Natural History Survey and Dr. H. J. Van Cleave of the University of Illinois, who cooperated with the author in many ways. Gratitude is felt for the fine cooperation of the Illinois State Department of Conservation and of the various farmers' and sportsmen's clubs throughout the state, too numerous to mention individually, in the collection of animals for study.

This paper is divided into two parts, the first dealing with a brief discussion of some parasites of three upland game birds of the state, the second reporting what was learned about parasites of the miscellaneous fur-bearing mammals that were collected by or sent to the Illinois Natural History Survey during the time of the author's connection with this organization.

UPLAND GAME BIRDS

At the time this report was written, no significant information was available concerning the parasites of the ring-necked pheasant, *Phasianus colchicus torquatus,* Gmelin; bobwhite quail, *Colinus virginianus virginianus* (Linnaeus); and greater prairie chicken, *Tympanuchus cupido americanus* (Reichenbach) in Illinois. Much had been learned and written about parasites of the pheasant and quail in other parts of the country, and game farms had contributed considerably to a knowledge of the parasites to which these birds are susceptible, but information concerning parasites of the prairie chicken was almost totally lacking throughout its entire range.

Because, at the time the present study was being made, the Section of Game Research and Management of the Illinois Natural History Survey was conducting a general ecological investigation of the protected prairie chicken in central Illinois, this bird received careful consideration, and the information concerning it is more nearly complete than that for the pheasant and quail in that in the prairie chicken

study the birds were fully autopsied, whereas in the pheasant and quail investigations only the viscera were examined.

During 1935 and in the early summer of 1936, dead young prairie chickens were found in unusually large numbers by Survey investigators on a study area in Jasper County, and others were reported in the vicinity by farmers. The present study was undertaken to determine the possible role of parasites as a cause of these deaths.

Because of the relative scarcity of the prairie chicken over the state as a whole and the desirability of making collections without significantly reducing breeding stock in the limited areas where birds were fairly abundant, and because of the low rate of survival of young in the drought summer of 1936, only a few birds were collected. Fourteen young and 14 adult prairie chickens were taken, most of them shot on the wing in Jasper and Richland counties during the summers of 1936 and 1937. Most of the birds were autopsied in field headquarters soon after collection. Examination comprised a search for external parasites or abnormalities, observations on the intact internal organs and, finally, separate examination of component parts of the viscera for helminth parasites or gross pathological change. When possible, blood smears were made and intestines and ceca examined for protozoan parasites.

Three species of cestodes, comprising two genera and one new species, two species of nematodes, one species of acanthocephalon, one species of louse and an undetermined species of mite constitute the list of parasites realized from this study of the prairie chicken.

The source of material for the quail and pheasant studies was the farmer and sportsman hunters of the state. To avoid sacrifice of the edible portions of the birds, the cooperating farmers and sportsmen were instructed to preserve only the viscera of quail and pheasants that were killed during the hunting season of 1936. One hundred forty-one quail were collected from 15 counties and 41 pheasants from 5 counties; the majority of the latter came from Livingston County.

The quail harbored four species of nematodes and two species of cestodes. The relatively few pheasants examined had only one species of helminth, a nematode. Since, in most instances, the respiratory tract was not preserved, this study does not supply information concerning the presence or absence of parasites of that tract.

The following discussion treats individually the hosts and their parasites. At the close of the discussion a list is given showing the parasites found in each host species.

The Greater Prairie Chicken

Tympanuchus cupido americanus

Cestodes

Tapeworms were by far the most important and abundant of the parasites found in the prairie chicken. They were found in 10 of the 14 young birds but in none of the 14 adults. The genera *Raillietina* and *Choanotaenia* were represented. Those cestodes belonging to the genus *Raillietina* were found to comprise a new species, which will be described elsewhere. This new species appeared in 9 of the 14 young birds and, since it differs distinctly from described species of poultry cestodes of the same genus, may be indigenous to the prairie chicken in this area. In four cases, the infestations were so intense as completely to occlude the lumen of the small intestine for most of its length. Infestations varied from 3 to 52 specimens but, because of size variation, numbers mean little. Seven specimens in one host filled the intestine as completely as did 52 smaller specimens in another host. The genus *Choanotaenia* was represented by seven specimens in two hosts. Two species were present, but neither could be identified with published descriptions of members of the genus.

Nematodes

Seurocyrnea colini (Cram), inhabiting the proventricular wall at its junction with the gizzard and using the cockroach, *Blatella germanica* (Linnaeus), as an intermediate host (Cram 1931), was taken in seven young and seven adult prairie chickens. Infestations ranged from 1 to 35 worms per individual, averaging 12.4 worms per infested young and 5.1 worms per adult bird. There is no indication that *S. colini* is ever responsible for a severe pathological condition of its hosts. It was originally described from quail in the southeastern states and has been reported

from the turkey in Georgia and from sharp-tailed grouse in Wisconsin and Montana; Gross (1930) in Wisconsin gave the first report of its occurrence in the prairie chicken.

Heterakis gallinae (Gmelin), the common cecal worm of poultry, was found in 11 of the 28 young and adult prairie chickens. No intermediate host is required for this parasite, the infestation being acquired when the birds eat over infested ground. Infestation ranged from 1 to 30 individuals per infested host and averaged 11.5 worms for the adult, 2.4 worms for the young birds. The presence of *Heterakis* in moderate numbers is not of serious consequence, although large numbers may cause unthriftiness. Barger & Card (1935) state, "The irritation caused by these small worms in the ceca often leads to a general unthriftiness, and in young chicks death may result from heavy infestation."

Heterakis gallinae has been reported from a number of wild birds and is common in quail, pheasant and domestic poultry. Its presence in wild game birds is indicative of their contact with domestic poultry. Game birds that range over ground occupied by domestic fowl are in danger of falling prey to fatal diseases of poultry, especially blackhead, a serious protozoan disease of domestic turkeys that may be contracted through eating the eggs of *H. gallinae* containing viable blackhead organisms. Gross (1930) reports *H. gallinae* in 50 per cent of the prairie chickens examined in Wisconsin and in association with a case of blackhead.

Acanthocephala

The thorny-headed worm has never before been reported from the prairie chicken. The two occurrences of *Mediorhynchus papillosus*, described by Van Cleave (1916), in this collection are undoubtedly accidental infestations. A single male worm was found in each of two young birds taken on the same area. Its presence in such limited numbers cannot be considered as important.

Lice

Menopon monostaechum Kellogg, identified by R. O. Malcomson of the University of Illinois, was taken from only four young prairie chickens, and the infestations were light in all cases, 36 being the heaviest infestation encountered. This is a new host record for this species of louse. Gross (1930) states that the louse parasitizing a large number of the prairie chickens of Wisconsin belongs to the genus *Chapinia*. In the numbers observed, lice are not significant. However, their presence is a potential threat to the health of the host, since under circumstances suitable to the parasites their numbers could quickly grow to serious proportions.

Mites

Two light infestations on young prairie chickens constitute the only records of mites during this study. The mites were not identified.

Protozoa

Blood smears were made of the majority of the prairie chickens collected. These were examined by Dr. R. R. Kudo of the University of Illinois and by the author, but they showed no indications of blood parasites of any kind. Smears of intestinal and cecal scrapings were negative for coccidia or other protozoa.

It is believed that one case of blackhead, caused by the protozoan *Histomonas meleagris* (Smith), was encountered. An adult male bird in an extremely emaciated and weakened condition was easily caught by a bird dog in use on the study area. It died before examination was possible. While it had the clinical symptoms of typical blackhead, the causative organism could not be definitely demonstrated, possibly because of the death of the host. As Gross (1930) had similarly found in Wisconsin, the infected bird was heavily parasitized with the cecal worm *Heterakis gallinae*. The Illinois bird was caught on an area where domestic turkeys known to have died of blackhead ranged widely.

The Bobwhite Quail

Colinus virginianus virginianus

Cestodes

Cestodes were taken from bobwhite quail in only two instances, once in Bond and once in Christian County. They were

identified as *Rhabdometra odiosa* (Leidy) and *Hymenolepis (Hymenolepis)* sp. The infestations were light.

Nematodes

Three species of cecal nematodes appeared in the quail collections, *Heterakis bonasae* Cram, *H. gallinae* (Gmelin) and *Subulura strongylina* (Rudolphi).

Heterakis bonasae, a characteristic parasite of quail in the southeastern states, was found only in Alexander County, at the southern tip of the state, in 18 of the 20 hosts. Only a single specimen of *H. gallinae* was noted from this county. While the percentage of *H. gallinae* may be higher than is here indicated, there is no doubt that *H. bonasae* highly predominates in this area. It seems reasonable to believe that the extreme southern part of the state may be the normal northern limit for this characteristic southern parasite.

Heterakis gallinae, found in 12 of the 15 counties from which quail were collected, takes the place of *H. bonasae* in the central and northern parts of the state as a dominant parasite. Its range is indicated in fig. 1. It is a common parasite of domestic poultry and would be expected to be found in wild birds frequenting areas ranged by poultry.

Subulura strongylina occurred in quail in only four centrally located counties, Bond, Sangamon, Montgomery and Christian. *Heterakis gallinae* existed in three of the four counties and in multiple infestations with *S. strongylina*. The latter species is a common parasite of domestic and wild birds in South America and was reported by Stoddard (1932) from quail in North Carolina. The pathogenicity of this parasite is unknown, but it is probably similar to that of *H. gallinae*. Fifty-one, or 36 per cent, of the 141 quail examined were infested with cecal worms of one or more of the above-mentioned species; 110 was the heaviest infestation encountered and 15 the average number for infested hosts.

Seurocyrnea colini (Cram), the proventricular worm, a common parasite of quail in the southeastern states, occurred in 21, or 15 per cent of the 141 quail, 18 of the infestations occurring in 20 quail from Alexander County at the southern tip of the state. It also was taken from Livingston, Sangamon and Jasper counties, where collections were few in number. Twenty-two specimens represented the heaviest infestation recorded. Infested hosts averaged 8 worms. No pathological condition has been attributed to this parasite.

Madison and Crawford counties had no parasites recorded for the three quail representing these areas. Obviously the number of birds from these counties is too small to be significant.

The Ring-Necked Pheasant

Phasianus colchicus torquatus

Nematodes

Heterakis gallinae (Gmelin) was the only parasite encountered in the pheasant. Nineteen of 41 birds, 46 per cent, harbored this cecal worm in varying degrees of infestation. The heaviest single infestation was 60 worms; the average infestation for parasitized birds was 18 worms. Although this parasite occurred in pheasants taken from five counties, fig. 2, 36 of the 41 birds examined came from Livingston County.

Conclusions

Prairie Chicken

It is not possible to draw any definite conclusions as to the role that parasites play in prairie chicken mortality in the area studied. The data obtained from 28 prairie chickens do not indicate that protozoan, arthropod and helminth parasites are responsible for any widespread loss of life in south-central Illinois. However, this study has been primarily limited to prairie chickens vigorous enough to be on the wing when shot and does not take into account birds which may have been too ill to flush. Neither does it determine the cause of death of the young prairie chickens whose remains were found by the Survey investigators or reported by others.

It seems reasonable to believe that some prairie chicken loss may occur from cestode infestation, inasmuch as considerable loss in domestic turkeys and other poultry is known to occur occasionally from this cause in south-central Illinois. Because cestodes of a previously undescribed species of *Raillietina* occurred in 10 of 14 young

birds and in 4 cases were so numerous or so large as to occlude the lumen of the greater part of the small intestine, they should not be overlooked as a factor in prairie chicken mortality.

References in the literature to *Raillietina* in wild birds for the most part do not give any indication of pathogenicity. Gross (1930) reported finding heavy infestations of cestodes of the genus *Raillietina* in sharp-tailed grouse and in one prairie chicken but made no mention of the age or condition of the hosts. Simon (1937) described *Raillietina (Skrjabinia) centro-*

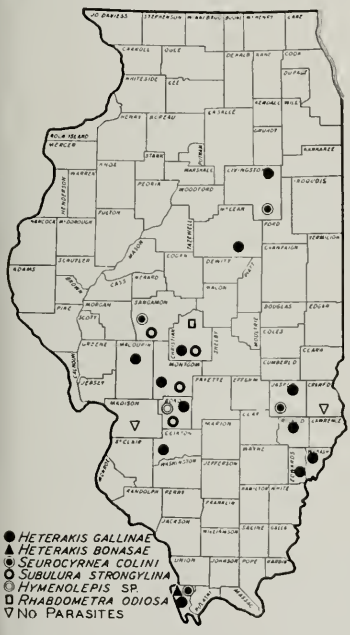

Fig. 1.—Range of helminths of quail in Illinois, as indicated by parasites found on 141 birds collected in hunting season of 1936.

cerci from the sage grouse in Wyoming but gave no indication of degree of infestation, age or condition of host.

Jones (Stoddard 1932) gave some evidence of the pathogenicity of this genus of cestodes by reporting that *Raillietina tetragona* was observed to be the principal or only cause of death of 25 young quail raised by bantam foster parents. Passage of food stopped, the intestinal lining sloughed off and some birds exhibited locomotor

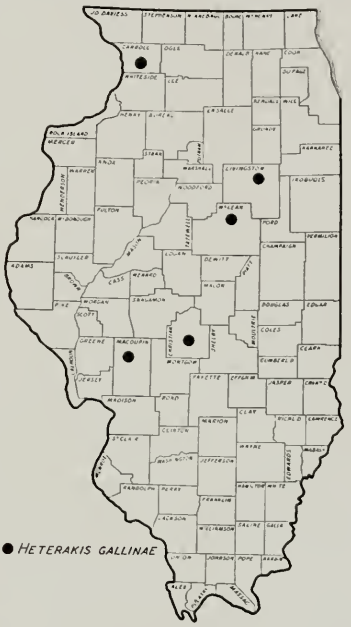

Fig. 2.—Range of helminths of ring-necked pheasants in Illinois, as indicated by parasites found on 41 birds collected in 1936.

difficulties. Jones also observed that *Raillietina cesticillus* caused less serious damage, but the vitality of the infested quail was greatly reduced.

The pathogenic effects of cestodes in poultry are well known, and it seems reasonable to believe that the effects on wild gallinaceous birds might be similar, at least in young birds heavily infested. Cestodes of the genus *Raillietina* are common in poultry. Buckley *et al.* (1933) state, "Loss of weight, loss of appetite, a general condition of droopiness or unthriftiness, intestinal catarrh and diarrhea are the conditions most frequently found associated with the presence of tapeworms. Young fowls are most seriously affected. Occa-

sionally lameness and paralysis have been associated with heavy infestations with certain tapeworms." Barger & Card (1935) state that "It has also been fairly well established that the worms (cestodes) produce substances during their growth which are harmful when absorbed by the fowl. In heavy infestations the bowel may be practically occluded, and the normal movement of intestinal contents greatly disturbed."

Although it cannot be definitely stated at this time that the high incidence and heavy infestations with cestodes of a genus known to be pathogenic for other gallinaceous birds constitute a serious mortality factor in young prairie chickens, it is reasonable to think that the minimum effect of such intense parasitism in birds 4 to 8 weeks old would be a reduction in vitality which would open the way to secondary infections and render the birds more susceptible to predation or unfavorable environmental factors. Finding no cestodes in adult hosts would seem to indicate that the prairie chicken is susceptible to the new species of *Raillietina* during only the first few weeks of life.

The nematodes in the indicated numbers cannot be regarded as dangerous, although *Heterakis gallinae* as a carrier of blackhead is a potential threat. External parasites, acanthocephala and parasitic protozoa do not seem, on the basis of autopsies performed on a small number of birds, to be important factors in prairie chicken mortality in the area studied.

Quail

The results of this study indicate that the quail of Illinois are not so heavily infested with the diversity of helminth parasites as are the quail of the southeastern states. Stoddard (1932) for the latter area reports 16 species of nematodes and 5 species of cestodes from quail. Additional data are necessary before the effects of parasites on Illinois quail can be determined.

Pheasant

The data available on the parasites of Illinois pheasants are not sufficient to enable the drawing of conclusions about them at this time.

Limitations of the Study

Because these observations on the prairie chicken, pheasant and quail embrace only a part of the year and do not cover all parts of the state, they do not indicate conclusively that helminth parasites are not an important consideration in the welfare of their hosts. The study needs to be extended to other seasons of the year, with particular attention given to the young birds, because mortality from parasitic infestations is most severe during the early weeks of life. Ideally, the studies should be made on the entire, freshly killed birds. Preserved viscera are only partially satisfactory for this type of study.

Host Parasite List

The numerals following the names of parasites below indicate the number of hosts in which the parasites were found. The letter preceding the name of each parasite may be identified from the following key: C, cestode; N, nematode; A, acanthocephalon; L, louse.

Greater Prairie Chicken, *Tympanuchus cupido americanus* (Reichenbach)
(28 examined)

C	*Raillietina (Skrjabinia)* sp. (undescribed)	9
C	*Choanotaenia* spp. (undescribed)	2
N	*Scurocyrnea colini*	14
N	*Heterakis gallinae*	11
A	*Mediorhynchus papillosus*	2
L	*Menopon monostaechum*	4
	Mites (unidentified)	2

Bobwhite Quail, *Colinus virginianus virginianus* (Linnaeus)
(141 examined)

C	*Rhabdometra odiosa*	1
C	*Hymenolepis (Hymenolepis)* sp.	1
N	*Heterakis bonasae*	18
N	*Heterakis gallinae*	31
N	*Subulura strongylina*	11
N	*Scurocyrnea colini*	21

Ring-Necked Pheasant, *Phasianus colchicus torquatus* Gmelin
(41 examined)

N	*Heterakis gallinae*	19

FUR-BEARING MAMMALS

In order to acquire a general knowledge of the diversity and prevalence of the helminth parasites of fur-bearing mammals in

Illinois, as opportunity afforded, the writer obtained and examined viscera of these animals taken by hunters. Sixteen opossums, 12 red foxes, 6 raccoons, 5 mink, 8 muskrats and 1 skunk, a total of 48 furbearers, comprise this incidental collection made during the hunting seasons of 1935-36 and 1936-37. Because this problem cannot be continued by the writer, the following information is made available.

All the helminths were identified to genus and, when the condition of the material justified it, to species. Seven species of trematodes, representing as many genera, 3 genera and species of cestodes, and 8 genera and species of nematodes, comprising a total of 18 genera and species, were found in the 48 host individuals. In view of the small number of hosts and host species, these results are surprising, and they suggest the desirability of further development of this problem in Illinois.

Pathogenicity of the helminth parasites identified is not discussed, since the condition of much of the material received did not warrant such observations. A study of the literature offers little information on pathogenicity of the parasites found in the hosts studied. So this report, because of the preliminary nature of the observations, consists of miscellaneous remarks on incidence and degree of infestation, morphology, distribution and host records. Parasites are listed by host at the close of the discussion.

Trematodes

Amphimerus pseudofelineus (Ward)

Biliary ducts of liver and gall bladder of opossum, *Didelphis virginiana*. Tuscola, Ill.

Occurred in two opossums from the same area. Liver ducts packed with 300 to 400 of the flukes. This is the first record of this species from the opossum. Stiles & Baker (1935) list only the domestic cat, *Felis catus domestica*, and the coyote, *Canis latrans*, as hosts. Wallace & Penner (1939) have recently described a similar trematode, *Opisthorchis tonkae*, from the bile ducts and gall bladder of the muskrat.

Brachylaemus opisthotrias (Lutz)

Intestine of opossum, *Didelphis virginiana*. Greenup, Olney, Tuscola and Urbana, Ill.

These forms measure 2 to 4 mm. in length and largely conform to Lutz's (1895) description of Brazilian trematodes from *Didelphis aurita*, but lack the spines. In this last respect, they agree with those described by Chandler (1932) in Texas. Because the spines are likely to slough off following the death of the host and its parasites, this characteristic has limited diagnostic value. These trematodes are much larger than the forms which Dickerson (1930) described as *Harmostomum opisthotrias* var. *virginianum*. Occurred in 5 of 16 hosts. Heaviest infestation was 115 worms. Average for infested hosts was 28 worms.

Catatropis filamentis Barker

Small intestine of muskrat, *Ondatra zibethica*. Sellers, Ill.

Only one specimen. Conforms to Barker's (1915) description except that the three rows of papillae are not observable.

Echinostoma revolutum (Froelich)

Intestine of muskrat, *Ondatra zibethica*. Sellers, Ill.

Intestine of opossum, *Didelphis virginiana*. St. Joseph, Ill.

Beaver (1937) has reduced the members of the genus *Echinostoma* by absolute synonymy of eight species and has expressed doubt concerning the validity of seven more species. *E. armigerum* and *E. coalitum* are direct synonyms of *E. revolutum*, and *E. callawayensis* is of doubtful validity (Barker 1915). All three species were described from the muskrat. So the echinostomes under consideration are assigned to *E. revolutum*. Beaver states that *E. revolutum* "would probably occur in almost any bird or mammal whose feeding habits are similar to the so-called 'natural hosts.'" Dikmans (1931) reports *Echinostoma* sp. in opossums in Louisiana. There were 8 worms in 1 of the 16 opossums and 1 worm in 1 of the 8 muskrats in the present investigation.

Echinoparyphium sp.

Small intestine of red fox, *Vulpes fulva*. Bath, Ill.

Two specimens taken from 1 of 12 hosts were not in condition for accurate specific determination. No record has been found of a previous occurrence of this genus in foxes.

Diplostomum variabile (Chandler)

Small intestine of opossum, *Didelphis virginiana*. Urbana and Tuscola, Ill.

First record of its occurrence since described by Chandler (1932) in Texas opossums. Great variation in size, shape and degree of division between fore and

hind bodies, reported by Chandler, observed in these forms, although none was observed to lack the glandular organs lateral to the pharynx. Because of the constancy of the glandular organs it is not likely that *Diplostomum variabile* could be confused with a similar species, *Neodiplostomum lucidum*, which La Rue & Bosma (1927) described from *Didelphis virginiana*. *Diplostomum variabile* was found in 2 of the 16 opossums. One hundred fifty-six worms constituted the heaviest infestation.

Rhopalias macrocanthus Chandler
Small intestine of opossum, *Didelphis virginiana*. Urbana, Ill.

Only one specimen. Conforms to Chandler's (1932) description of Texas forms.

Cestodes

Hymenolepis (Weinlandia) sp.
Small intestine of opossum, *Didelphis virginiana*. Urbana, Ill.

Hooks were gone from rostella; so specific determination could not be made. As far as can be ascertained this genus has been reported only once from marsupials, from *Peremeles macrura* in Australia (Imperial Bureau of Agricultural Parasitology 1933). There were 3 specimens in 1 of the 16 hosts.

Oochoristica mephitis Skinker
Small intestine of skunk, *Mephitis mephitis*. Urbana, Ill.

Described by Skinker (1935) from *Mephitis elongata* in Georgia. Specimens from *M. mephitis* in Illinois conform to Skinker's description. Sixteen specimens were found in the only skunk collected.

Oochoristica sp.
Small intestine of raccoon, *Procyon lotor*. Tuscola, Ill.
Small intestine of opossum, *Didelphis virginiana*. Champaign County, Ill.

Specific identification could not be made due to immaturity of the specimens. Three specimens were taken from 1 of the 16 opossums and 75 were taken from 1 of the 6 raccoons.

Taenia pisiformis (Bloch)
Intestine of red fox, *Vulpes fulva*. Bath, Arcola and Dwight, Ill.

This species has been reported from the European fox, *Vulpes vulpes*, but not from the American fox, *Vulpes fulva*. Reported from species of *Felis, Canis* and *Procyon*. Because of immaturity of the specimens, identification was made on scolex characters alone; so the determination is questionable. Six of 12 foxes were infested. The maximum infestation was seven helminths.

Nematodes

Ascaris sp.
Small intestine of raccoon, *Procyon lotor*. Tuscola and Urbana, Ill.

These ascarids were taken from four of the six raccoons examined. Morphologically they do not differ significantly from *Ascaris lumbricoides*. The genus *Ascaris* has not previously been reported from the raccoon. *Ascaris* did not occur in other mammals collected. Maximum infestation was 71 helminths; average for infested hosts, 27 helminths.

Arthrocephalus sp.
Small intestine of raccoon, *Procyon lotor*. Tuscola and Havana, Ill.

This genus of nematodes has not previously been reported for *Procyon lotor*, but Vaz (1935) has redescribed *Arthrocephalus maxillaris* (Molin) from *Procyon cancrivorus* in South America. Since the form under consideration shows capsule characters not figured by Vaz, it is not assigned to *A. maxillaris*. Other characters conform to Vaz's description. Two of the six hosts were infested. Each had approximately 100 specimens.

Ancylostoma caninum (Ercolani)
Small intestine of red fox, *Vulpes fulva*. Havana, Ill.

Only one specimen. A common and widely distributed hookworm of dogs and cats. Has often been reported from European foxes, but no previous specific record has been found of its occurrence in *Vulpes fulva* in North America.

Cruzia tentaculata (Rudolphi)
Intestine and cecum of opossum, *Didelphis virginiana*. Havana, Tuscola and Greenup, Ill.

Has been recorded for South American *Didelphis*, and for *D. virginiana* in Pennsylvania, Texas and Louisiana (Chandler 1932, Dikmans 1931). Four of 16 hosts were infested. The heaviest infestation was 120 specimens; 44 was the average per infested host.

Trichuris sp.
Large intestine of red fox, *Vulpes fulva*. Bath, Ill.

Possibly *Trichuris vulpis* (Froelich) but, because of the absence of males, specific identification was not made. It is the only valid species listed for foxes in Stiles

& Baker (1935). Two specimens were found in 1 of the 12 hosts.

Toxocara canis (Werner) = *Belascaris marginata* (Rudolphi)

Small intestine of red fox, *Vulpes fulva*. Bath, Havana, Arcola, Manville and Dwight, Ill.

Occurred in all 12 foxes examined. A common parasite of various species of *Felis*, *Canis* and *Vulpes*. This common ascarid of dogs is one of the most frequent parasites of foxes and may cause serious trouble in young puppies. Heaviest infestation was 30 specimens; the average was 12 specimens per host.

Physaloptera turgida (Rudolphi)

Stomach and intestine of opossum, *Didelphis virginiana*. Urbana, Tuscola, St. Joseph, Greenup, Danville and Olney, Ill.

Stomach and intestine of raccoon, *Procyon lotor*. Tuscola, Ill.

Stomach and intestine of skunk, *Mephitis mephitis*. Urbana, Ill.

This nematode seems to be a common and cosmopolitan parasite of the opossum. Members of this genus from the raccoon and skunk did not differ noticeably from those from the opossum; hence, they are assigned to the same species. This is the first record of *Physaloptera turgida* from *Procyon lotor* and *Mephitis mephitis*. Found in 15 of 16 opossums; 49 specimens were the maximum and 18 specimens the average infestation. Sixty-three specimens were in one of six raccoons. Five specimens were found in the only skunk collected.

Viannaia bursobscura (Dikmans)

Small intestine of opossum, *Didelphis virginiana*. Urbana, Ill.

Sixty small, coiled worms, blood-red when alive, were found in only one opossum; first record of this species since its description by Dikmans (1931).

Host Parasite List

The numerals following the names of parasites indicate the number of hosts in which the parasites were found. The letter preceding the name of each parasite may be identified from the following key: T, trematode; C, cestode; N, nematode.

Opossum, *Didelphis virginiana* Kerr
(16 examined)

T	*Echinostoma revolutum*	1
T	*Brachylaemus opisthotrias*	5
T	*Amphimerus pseudofelineus*	2
T	*Diplostomum variabile*	2
T	*Rhopalias macrocanthus*	1
C	*Hymenolepis (Weinlandia)* sp.	1
C	*Oochoristica* sp.	1
N	*Cruzia tentaculata*	4
N	*Viannaia bursobscura*	1
N	*Physaloptera turgida*	15

Red Fox, *Vulpes fulva* Desmarest
(12 examined)

T	*Echinoparyphium* sp.	1
C	*Taenia pisiformis* (?)	6
N	*Ancylostoma caninum*	1
N	*Toxocara canis*	12
N	*Trichuris* sp.	1

Raccoon, *Procyon lotor* (Linnaeus)
(6 examined)

C	*Oochoristica* sp.	1
N	*Ascaris* sp.	4
N	*Arthrocephalus* sp.	2
N	*Physaloptera turgida*	1

Skunk, *Mephitis mephitis* (Schreber)
(1 examined)

C	*Oochoristica mephitis*	1
N	*Physaloptera turgida*	1

Mink, *Mustela vison* Schreber
(5 examined)

No helminth parasites found

Muskrat, *Ondatra zibethica* (Linnaeus)
(8 examined)

T	*Echinostoma revolutum*	1
T	*Catatropis filamentis*	1

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