

HELMINTHS FROM MANITOBA PASSERINE BIRDS
with a chapter on Helminths from Manitoba
Chickens

A THESIS
Presented to
The Faculty of Graduate Studies and Research
University of Manitoba

In Partial Fulfillment
of the Requirements for the Degree
Master of Science

by
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May 1963



ACKNOWLEDGMENTS

I wish to express my sincere appreciation to my adviser, Dr. J.A. McLeod, for suggesting the project, for his help and advice, and also for providing a grant in aid of this research. I am also indebted to Dr. G. Lubinsky for the help he gave in the process of preparation of this thesis.

Thanks are also due to Dr. I. Szilwasy for supplying most of the chicken guts.

ABSTRACT

Twenty species of helminths - nine trematodes, five cestodes, and six nematodes - are recorded from eighty-five birds examined. No new species are described. A number of new locality and host records are reported.

A chapter on helminths from Manitoba chickens is included. Three species of nematodes and three of cestodes are reported from one hundred and thirty chickens examined.

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INTRODUCTION

The ever growing economic importance of birds furnishes an additional reason for the desirability of a study of their parasites. Poultry raising is of a very widespread general interest in Canada and the United States; water birds and other game birds are of importance from an economic point of view. Other wild birds, especially the passeriforms, are of very little economic value hence the scientist and the layman have tended to neglect them. Song birds, however, have been known to act as reservoirs of the viruses which cause Western Equine Encephalitis and Russian Tick-borne Encephalitis. The only real interest in these birds is centred around their beautiful songs and call notes and their wonderful colours and plumages which are a joy and the major attraction to the bird watcher and the amateur ornithologist.

Many parasites of various animals, birds included, are known to be pathogenic. It is obvious therefore that the knowledge of helminth parasites of birds has real practical as well as scientific value. Clapham (16) put forward evidence to show that wild birds, in particular rooks, starlings, and sparrows, spread eggs of helminths of fowls to fresh pastures where they may infect the domestic stock. Furthermore young poultry may become infected with some parasites of the wild birds. It is hoped that a study such as the present one will

stimulate interest and pave the way for further research into the parasites of wild birds in the province of Manitoba.

In all, 85 birds belonging to 26 species were examined; 49 of them harboured one or more species of helminths. Twenty species of parasites were found: nine trematodes, five cestodes, and six nematodes. No new species were described.

The area covered in the survey was approximately 100 miles radius around the city of Winnipeg. Bird collection was done mainly along lake shores and marshes since these areas abound in birds and are safe for shooting purposes. The great majority of birds was collected on the southern beaches of Lake Manitoba and Lake Winnipeg; Norris, Shoal, Gull and Long Lakes and the marshes near Libau and Lockport.

HISTORICAL REVIEW

Very little work has been done in Canada on helminths of wild birds and especially of passerine birds, though the economically important, domestic and wild aquatic birds have received much attention. Lack of interest in the passerine and other perching birds may be explained by the fact that, apart from the minor damage they cause to the crop in the fields, they are practically of no economic importance.

One of the earliest papers on helminths of Canadian vertebrates, including birds, is that of Stafford (84) who restricted his study mainly to cestodes. Cooper (19) investigated the trematodes and cestodes of the Canadian Arctic. Swales (85, 86) reviewed the literature on Canadian helminths up to 1933, restricting his study to the parasites of domesticated and semi-domesticated mammals and of economically important birds of Canada. Wardle (97) and later Wardle and McLeod (98) reviewed the literature on the tapeworms of Canada as well as world literature concerning this most interesting class of helminths. Parnell (69) surveyed the endoparasites of domestic and wild animals in northeast Canada. Van Cleave and Williams (94) discussed the distribution of acanthocephalans from passerine birds in Alaska and the Canadian Arctic. They described two new species, Plagiorhynchus paulus from Townsend's Fox Sparrow and Lueheia boreotis from Turdus

migratorius caurinus (Grinnell). Centrorhynchus scanensis, which has been known from Northern Europe, was recorded for the first time in North America from the Pacific thrush (Ixoreus naevius naevius) on Douglas Island. Mahon (47) listed 24 species of cestodes from birds collected all over Canada. Mawson's papers were the first major contribution to our knowledge of the nematodes of birds throughout Canada. She reported (51) 13 species of ascaroids from passeriforms and anseriforms in Canada; of these Porrocaecum trichuriforme, Contraceaecum anasi, and Heterakis pediocetes are new. She gave a new name, Contraceaecum yamaguti, to the "Contraceaecum sp." described by Yamaguti in 1941 from the Japanese merganser. In a second paper (52) she identified capillarid worms from passerine and anatid birds on the Montreal Island. She recorded Capillaria quinscali Read, 1949 from the European starling and the Bronze grackle and found that this species conformed to the description of Capillaria ovopunctatum (von Linstow); she therefore concluded that C. quinscali and C. ovopunctatum are the same species. In a third paper (53) Mawson identified 4 trichostrongylids from anseriform birds. She recorded Trichostrongylus tenuis (Mehlis) for the first time in Canada. In another paper (54) she described 3 new species of spirurid nematodes from Canadian birds. These are: Microtetrameres canadensis from the Snowy owl and the Great blue heron; Synhimatus canadensis from the Bittern and the Great blue heron; and Echinuria borealis from ducks. In a later paper (55) Mawson listed 5 species of spirurid

nematodes from birds in Canada; of these Microtetrameres helix, Cram was found in a Crow from Montreal Island. Anderson, (3) working on filarioid nematodes, described two new species - Diplotrriaenoides translucidus and Ornithofilaria inornata from the body cavity of the Oven bird and the Wood thrush respectively. Mawson (56) extended her survey by recording 9 species of filariid nematodes from birds in Canada. Of these 4 species are new - Desmidocerca nudicauda, Carinema ardae, and Avioserpens nana from the Great blue heron (Ardea herodias); and Diplotrriaena sialiae from the Mountain bluebird (Sialia currucoides).

The following helminthological surveys and investigations were undertaken in Eastern Canada. In 1932 Rayner (74) examined the ecto- and endo-parasites of poultry and wild birds to see if the latter hosts might be responsible for the transmission of poultry diseases. He found no evidence that any of the internal parasites of poultry were harboured by these wild birds. Included in his list are Anonchotaenia globata from Passer domesticus and Liga brasiliensis from Colaptes auratus luteus. Miller (63) has found two species of nematodes - Ascaridia columbae and Capillaria columbae - and one species of trematode - Echinostoma paraulum - in the domestic pigeon from the province of Ontario. He has compiled a check-list of pigeon parasites. Cannon (14) found 8 species of trematodes in aquatic birds; and described a new species, Stephanoprora mergi, from Mergus merganser americanus. He

also recorded Echinoparyphium elegans and Psilochasmus long-icirratus for the first time in America. Later (15) he found 2 species of cestodes - Hymenolepis farciminosa and Choanotaenia musculosa - and one species of nematodes - Capillaria columbae var. sturni - in the small intestine of the European starling (Sturnus vulgaris) in Quebec. In his paper on blood parasites in Ontario birds Clarke (17) stated that the principal blood infections were protozoal, but microfilariae were also present. Judd (42) reported Diplotrriaena tricuspis from the body cavity of a Nashville warbler, Vermivora ruficapilla, at London in Ontario.

The helminth fauna of Manitoba birds has remained almost unknown until the publication in 1937 of McLeod's paper (60) in which he described two new schistosomatid trematodes from water birds - Pseudobilharzia querquedulae from the Blue-winged teal and Ornithobilharzia lari from the Herring gull, both causing swimmers itch in this province. Later Savage and Isa (79) reported Prosthogonimus macrorchis in chickens for the first time in the province. Neufeld (66) in an unpublished thesis surveyed the cestodes of water and shore birds and recorded 26 species from 16 bird hosts. He described a new species, Hymenolepis oligoproglottina from a Sandpiper from York Factory in Northern Manitoba. Freedman (29) in another unpublished thesis recorded 37 trematode species from Manitoba

water and shore birds. The six new species described are: Parastrigea neorobusta, Cotylurus mcleodi, Stephanoprora lari, Xenisma wardlei, Echinostoma platyrhynchi, and Echinostoma manitobensis. Up to date, very little has been done on the nematodes of wild birds in this province.

A historical review of the literature on bird parasites of Canada will be incomplete without an inclusion of the more important helminthological surveys undertaken in the United States. Most of the wild birds of Canada migrate to the southern parts of North America during the winter months and carry with them their parasitic fauna. Reports from the United States of helminths of these birds are, therefore, of immense value in the identification of the parasites which may be collected in Canada.

As early as 1909 Ransom (72) surveyed the taenioid cestodes of north America. He diagnosed every genus in the group and devised a key for the identification of the genera. This was followed by Walton (96) who described new and little-known nematode parasites from birds and mammals in Illinois State; and Cram (20) who reviewed and redescribed the species of nematode suborders Strongylata, Ascaridata, and Spirurata from birds of North America. Linton (45) surveyed the cestodes of aquatic and passerine birds in Massachusetts. Mayhew (57) studied the avian species of the cestode family Hymenolepididae. His revision of the genus Hymenolepis on the basis of the arrangement of the testes did not meet with approval of helminthologists and has

been generally disregarded by later workers. Denton and Byrd (24) surveyed the dicrocoeliid parasites in wild birds from the southern United States; while Schell (82) reported 4 new dicrocoeliid species from birds in the Pacific Northwest. Olsen (67) reviewed the known species of the subfamily Plagiorchiinae and Kagan (43) - the genera of the subfamily Leucochloridiinae whose species were dealt with by McIntosh (59). Hughes (35) presented an exhaustive key of species of the genus Hymenolepis. Rausch and Morgan (73) reviewed the literature on the little known genus Anonchotaenia from vertebrates with special reference to North American forms.

Read (75) described capillariid nematodes from passerine birds in Texas and Louisiana. Schell (81), Boyd (13), and Ellis (27) reported Microtetrameres in perching birds from various states of North America. Other reports are those of Seibert (83) on the diplotriaenid nematodes from birds; and of Boyd (12) and Daly (22) who surveyed the helminths of the starling and the crow respectively.

MATERIALS AND METHODS

The material for this project was collected during the summer and the earlier part of the fall of 1962. The birds were shot and identified in the field by the use of Peterson's (1961 Edition) 'Field Guide to the Birds'. Initially the birds were preserved in an icebox and the guts removed in the laboratory on return from the field trip. The worms, especially the cestodes, were found in an unsatisfactory condition, parts having dissolved away or showing signs of decomposition. The nematodes were not affected but the trematodes died in the contracted state. Later evisceration was done in the field immediately after killing the birds and the guts were stored in separate bottles, containing physiological saline, kept in the icebox. In the laboratory the bottles were transferred into a refrigerator and the guts tackled one after the other. Under this condition certain of the trematodes were found to survive for five days in the stored guts. To facilitate inspection each gut was divided into segments thus: rectum and caeca, small intestine (subdivided for convenience), stomach, gizzard, proventriculus, and liver. Each gut segment was slit open in physiological saline and the larger worms were recovered under an illuminated, mounted magnifying lens. The gut contents were scraped into a petri dish and examined under dissecting binoculars for smaller specimens.

The specimens were washed repeatedly in tap water. Large ones were relaxed in 2% Magnesium chloride ($MgCl_2$) or

2% Magnesium sulphate ($MgSO_4 \cdot 7H_2O$) for periods ranging from 3 to 36 hours. The smaller and more delicate worms were relaxed in 4% Chloral hydrate for the same periods of time.

The large trematodes and cestodes were fixed under slight pressure from a coverslip in Alcohol-Formol-Acetic Acid (A.F.A.) Fixative or Bouin Fixative. The use of Bouin Fixative was discontinued since the specimens, after repeated washing in Lithium carbonate (Li_2CO_3) or 70% Ethyl Alcohol, slightly retained the yellow colour which interfered with staining. Alcohol-Formol-Acetic Fixative is colourless and apart from its fixative properties it serves as an excellent preservative. Specimens could be kept in this solution until required. The nematodes were killed in a relaxed condition in hot 70% Ethyl Alcohol and preserved in the same medium or in 10% Formalin.

The trematodes and the cestodes were stained in Gower's Carmine. The nematodes were cleared in Lactic Acid for about 3 days and mounted temporarily in the same medium for examination. No stained or permanent mounts of nematodes were attempted. After identification the worms were returned to the preservative.

The formulae and procedures of the fixatives and stains used are as follows:

Alcohol-Formol-Acetic (A.F.A.) Fixative

Ethyl Alcohol (80%).....	18 parts.
Formol (undiluted).....	2 parts.
Acetic Acid (glacial).....	1 part.

1. Leave specimen in the fixative overnight until it is opaque.
2. Store in same medium until required.
3. Wash specimen in running tap water prior to staining.

Bouin's Fixative

Picric Acid (saturated aqueous solution)-----75 ml.

Formalin (40% HCHO)-----25 ml.

Acetic Acid (Glacial)----- 5 ml.

Solution keeps indefinitely.

1. Fix 12 to 24 hours.
2. Store in same medium or 70% Ethyl Alcohol.
3. Wash specimen in 2 to 4% Lithium carbonate (Li_2CO_3) or several changes of 70% Alcohol, (to clear out picric acid) before staining.

Gower's Carmine Stain

Boil 10 grams of Carmine in 100cc. of 45% glacial Acetic Acid. Cool and filter. Carefully remove the filter paper from the funnel and spread out to dry. When quite dry, remove powder and use to prepare stain as follows:

Acidified Carmine----- 1 gram.

Alum (potash alum)-----10 grams.

Distilled water-----200 cc.

The ingredients are mixed and dissolved by the aid of heat. When the crystals are completely dissolved and cooled, filter the mixture and add a crystal of thymol to prevent mould growth.

This is an excellent stain for trematodes especially, and cestodes. The stain gives a deep rose red colour to the principal organs. It is purely a nuclear stain and there is no diffuse stain to the cytoplasm. Thus the organs stand out in a practically transparent body.

1. After the worms are fixed and washed, if not already in water they should be brought to water or not over 20% alcohol.
2. Place in stain for 12 to 36 hours, depending on size of object.
3. Wash in one or two changes of water.
4. Dehydrate through 20%; 35%; 50%; 70%; 80%; 90% and absolute alcohols.
5. Further dehydrate and slightly clear in terpineol.
6. Clear in pure xylol and mount in Permount.
7. Store away to dry.

Photography:

A simple but accurate and time-saving technique was used for photographing the helminths. The mounted specimen was projected under a bioscope or 35 mm. enlarger onto a sheet of F3 Kodak photographic paper. This was then developed and fixed

and thus a negative print of the specimen was obtained.

This technique has been used to photograph nematodes in the course of the last decade. It has been modified by Mr. Bill Evans - a graduate student of the Department of Zoology, University of Manitoba - who used it widely in his studies on trematodes.

LIST OF HELMINTHS FOUND

TREMATODA

Family Brachylaemidae Joyeux and Foley, 1930

Subfamily Leucochloridiinae Poche, 1907

1. Leucochloridium melospizae McIntosh, 1932

Melospiza melodia juddi (Song Sparrow) - Small intestine;
Libau marshes. New record for Manitoba and Canada.

2. Urogenimus dryobatae (McIntosh, 1932) Kagan 1952

Molothrus ater ater (Brown-headed Cowbird) - Small
intestine; Norris Lake. New record for Manitoba and
Canada.

Dumetella carolinensis (Catbird) - Small intestine; Twin
Lakes Beach of Lake Manitoba. New record for Manitoba
and Canada, and new host record.

Family Dicrocoeliidae Odhner, 1910

Subfamily Dicrocoelliinae Looss, 1899

3. Conspicuum icteridorum Denton and Byrd, 1951

Quiscalus quiscula versicolor (Common Grackle) - Gall
bladder; Lockport Lagoon. New record for Manitoba and Canada.

4. Conspicuum macrorchis Denton and Byrd, 1951

Agelaius phoeniceus phoeniceus (Redwinged Blackbird) - Gall
bladder; Norris Lake. New record for Manitoba and Canada,
and new host record.

5. Zonorchis alveyi (Martin and Gee, 1949)

Zonotrichia albicollis (White-throated Sparrow) - Gall
bladder; Lockport Lagoon. New record for Manitoba and Canada.

Family Plagiorchiidae Ward, 1917

Subfamily Plagiorchiinae Pratt, 1902

6. Plagiorchis gonzalchavezii Zerecero, 1949

Tyrannus tyrannus (Eastern Kingbird) - Small intestine;
Francis Beach of Lake Manitoba. New record for Manitoba
and Canada.

7. Plagiorchis gonzalchavezii (?)

Agelaius phoeniceus phoeniceus (Red-Winged Blackbird) -
Small intestine; Francis Beach of Lake Manitoba. New
record for Manitoba and Canada.

8. Plagiorchoides noblei (Park 1936) Olsen, 1937

Agelaius phoeniceus phoeniceus (Red-Winged Blackbird) -
Small intestine; Long Lake, Gull Lake, Norris Lake, Francis
Beach of Lake Manitoba, Lockport Lagoon.

Xanthocephalus xanthocephalus (Yellow-headed Blackbird)
Small intestine; Norris Lake, Long Lake. A new host record.

Icterus galbula (Baltimore Oriole) - Small intestine; Libau
marshes. A new host record.

Vireo gilvus gilvus (Warbling Vireo) - Large intestine
(rectum); Norris Lake. A new host record.

All the above are new records for Manitoba and Canada.

Family Echinostomatidae Looss, 1902

Subfamily Echinostomatinae (Looss 1899)

9. Echinoparyphium sp.

Dumetella carolinensis (Catbird) - Small intestine; Norris
Lake.

CESTODA

Family Davaineidae Fuhrmann, 1907

Subfamily Davaineinae Braun, 1900

10. Raillietina (Raillietina) tetragona Molin, 1858

Bonasa umbellus umbelloides (Ruffed Grouse) - Large intestine (rectum); Norris Lake.

Family Hymenolepididae Railliet and Henry, 1909

Subfamily Hymenolepidinae Perrier, 1897

11. Hymenolepis corvi Mayhew, 1925

Corvus brachyrhynchos brachyrhynchos (Common Crow) - Small intestine; Norris Lake. New record for Manitoba.

12. Hymenolepis planestici Mayhew, 1925

Turdus migratorius migratorius (Robin) - Duodenum; Norris Lake. New Record for Manitoba.

Family Dilepididae (Railliet and Henry, 1909)

Subfamily Dilepidinae Fuhrmann, 1907

13. Liga brasiliensis Parona, 1901

Colaptes auratus borealis (Golden-winged Woodpecker or Yellow-shafted Flicker) - Duodenum and small intestine; Grand Beach of Lake Winnipeg, Norris Lake. New record for Manitoba.

Subfamily Paruterininae Fuhrmann 1907

14. Anonchotaenia globata (von Linstow, 1870)

Molothrus ater ater (Brown-headed Cowbird) - Small intestine and duodenum; Norris Lake. New record for Manitoba.

NEMATODA

Family Trichuridae Railliet, 1915

Subfamily Capillariinae Railliet, 1915

15. Capillaria quiscali Read, 1949

Quiscalus quiscula versicolor (Common Grackle) - Small intestine; Lockport Lagoon. New record for Manitoba.

16. Capillaria tridens (Dujardin, 1845)

Pipilo erythrophthalmus erythrophthalmus (Eastern Towhee) Small intestine; Norris Lake. New record for Manitoba and Canada and a new host record.

Family Tetrameridae Travassos, 1914

17. Microtetrameres helix Gram, 1927

Corvus brachyrhynchos brachyrhynchos (Common Crow) - Proventriculus; Norris Lake. New record for Manitoba.

18. Microtetrameres sp.

Quiscalus quiscula versicolor (Common Grackle) - Proventriculus; Francis Beach of Lake Manitoba.

Family Filariidae Claus, 1885

Subfamily Diplotriaeninae Skrjabin, 1916

19. Diplotriaena thomasi Seibert, 1944

Xanthocephalus xanthocephalus (Yellow-headed Blackbird) Mediastinum; Long Lake. New record for Manitoba and new host record.

20. Diplotriaena sialiae Mawson, 1957

Quiscalus quiscula versicolor (Common Grackle) - Mediastinum; Lockport Lagoon. New record for Manitoba.

LIST OF BIRD HOSTS

Order Passeriformes

Suborder Passeres (Oscines)

Family Icteridae

1. Agelaius phoeniceus phoeniceus (Linnaeus, 1766)
Plagiorchoides noblei (Park, 1936)
Plagiorchis gonzalchavezii (?)
Conspicuum macrorchis Denton and Byrd, 1951
2. Xanthocephalus xanthocephalus (Bonaparte, 1826)
Plagiorchoides noblei (Park, 1936)
Diplotriaena thomasi Seibert, 1944
3. Icterus galbula (Linnaeus, 1758)
Plagiorchoides noblei (Park, 1936)
4. Molothrus ater ater (Boddaert, 1783)
Urogonimus dryobatae (McIntosh, 1932)
Anonchotaenia globata (von Linstow, 1870)
5. Quiscalus quiscula versicolor Vieillot, 1819
Conspicuum icteridorum Denton and Byrd, 1951
Capillaria quiscali Read, 1949
Microtetrameres sp.
Diplotriaena sialiae Mawson, 1957

Family TURDIDAE

6. Turdus migratorius migratorius Linnaeus, 1766
Hymenolepis planestici Mayhew, 1925

Family MIMIDAE

7. Dumetella carolinensis (Linnaeus, 1766)
Echinoparyphium sp.
Urogonimus dryobatae (McIntosh, 1932)

Family CORVIDAE

8. Corvus brachyrhynchos brachyrhynchos Brehm, 1822
Hymenolepis corvi Mayhew, 1925
Microtetrameres helix Cram, 1927

Family VIREONIDAE

9. Vireo gilvus gilvus (Vieillot, 1807)
Plagiorchoides noblei Park, 1936)

Family FRINGILLIDAE

10. Pipilo erythrophthalmus erythrophthalmus (Linnaeus, 1758)
Capillaria tridens (Dujardin, 1845)
11. Zonotrichia albicollis (Gmelin, 1789)
Zonorchis alveyi (Martin and Gee, 1949)
12. Melospiza melodia juddi (Bishop, 1896)
Leucochloridium melospizae McIntosh, 1932

Suborder Tyranni

Family TYRANNIDAE

13. Tyrannus tyrannus Linnaeus, 1758
Plagiorchis gonzalchavezii Zerecero, 1949

Order Galliformes

Family TETRAONIDAE

14. Bonasa umbellus umbelloides (Douglas, 1829)

Raillietina tetragona Molin, 1858

Order Piciformes

Family PICIDAE

15. Colaptes auratus borealis Ridgway, 1911

Liga brasiliensis Parona, 1901

NOTES ON TREMATODES

Family Brachylaemidae Joyeux and Foley, 1930

Subfamily Leucochloridiinae Poche, 1907

The Genus Leucochloridium Carus, 1835

Much confusion concerning the systematics of the genus Leucochloridium was due to unnecessary creation of many new species. The chief offender was McIntoch (58, 59) who practically created a new species for each new host record. Kagan (43) reviewed the available literature and rectified the existing misconceptions of the taxonomy by retaining the genus Leucochloridium Carus, 1835, removing some species into the genus Urogonimus Monticelli, 1888, and creating a new genus Neoleucochloridium.

The following key for the identification of the genera of the subfamily Leucochloridiinae is reproduced from Kagan:

1. A. Body elongate; suckers weakly developed...Urotocus
B. Body elliptical, oblong or oval; suckers large...2
2. A. Vitellaria short, extending to level of posterior testis. Uterus does not circle acetabulum.
Cirrus short and stubby..... Urogonimus
B. Vitellaria extending to hind end of body. Uterus circling acetabulum passing between acetabulum and pharynx. Genital glands forming a triangle.....3
3. A. Uterus extracaecal. Cirrus long and narrow, smooth or spinose..... Leucochloridium
B. Uterus intracaecal. Cirrus long and pustulated
..... Neoleucochloridium

In our material one species of the genus Leucochloridium and one of the genus Urogonimus were found.

Leucochloridium melospizae McIntosh, 1932

A single specimen of Leucochloridium melospizae was recovered from the lower part of the small intestine of a male Song Sparrow (melospiza melodia juddi). The bird was shot on August 14, 1962 in the Libau marshes off the southern beach of Lake Winnipeg. The yellow colour displayed by the live worm might be due to absorption of some pigment from the intestinal content of the bird. The stained and mounted specimen still showed traces of this.

The size of the body and of internal organs was larger than those of the type specimens. In our material the oral sucker was slightly larger than the acetabulum. The pharynx did not overlap the acetabulum. The testes were slightly smaller than the ovary. The vitellaria were mainly extracaecal and extended to the level of the ends of the intestinal caeca. The cirrus pouch was sub-spherical and about the size of the posterior testis. The subterminal genital pore was slit-like. The highly convoluted uterus contained dark masses of embryonated eggs. The size of the eggs ranged from 0.013 to 0.015 mm. by 0.018 to 0.025 mm., the average being 0.014 by 0.022 mm.

In Table 1 (page 26) our measurements are compared with those of McIntosh.

Urogonimus dryobatae (McIntosh, 1932) Kagan, 1952

12 specimens of Urogonimus dryobatae were recovered from the rectum and the lower portion of the small intestine of a female Brown-headed Cowbird (Molothrus ater ater) which was killed on July 14, 1962 near Norris Lake about 40 miles north-west of Winnipeg. 5 worms of the same species were collected also from the lower part of the small intestine of a female Catbird (Dumetella carolinensis) shot on August 8, 1962 at the Twin Lakes Beach of Lake Manitoba. This is the first record of Urogonimus dryobatae from the catbird.

Urogonimus dryobatae from Molothrus ater ater

Our specimens showed variations in the arrangement of the reproductive organs. In 4 of the 12 specimens the anterior testis was diagonally placed to the ovary. In a few of the specimens the uterus did not make a complete circle around the acetabulum anteriorly. The region of the gonads was not heavily invaded by the uterine loops but the anterior testis was completely or partially covered. In one worm the egg-laden uterus covered all the available space thereby masking the

PLATE I

- Fig. 1. Urogonimus dryobatae from Dumetella carolinensis. Ventral View. x42
- Fig. 2. U. dryobatae from Molothrus ater ater with the uterus completely encircling the acetabulum. Ventral View. x28
- Fig. 3. U. dryobatae with the uterus making an incomplete circle around the acetabulum. Ventral View. x28

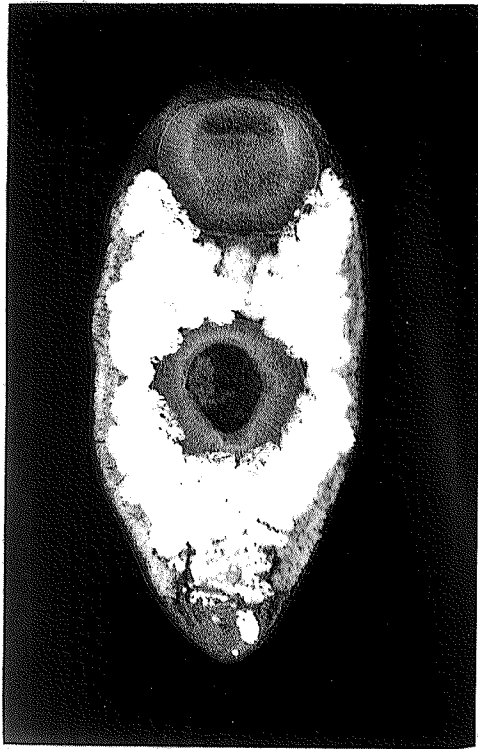


Fig. 1

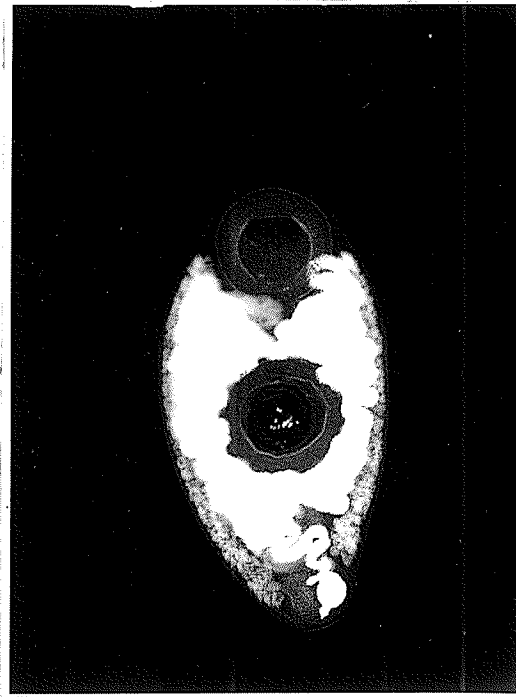


Fig. 2

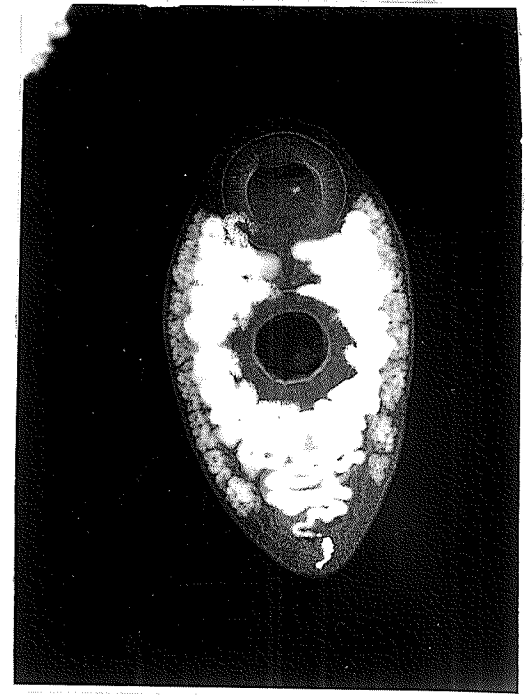


Fig. 3

genital organs and the parynx. The vitellaria were extracaecal and extended posteriorly to the region of the posterior testis. Figures 2 and 3 (page 24) show variations in the arrangement of the internal organs.

U. dryobatae from Dumetella carolinensis.

This trematode was smaller than those collected from the cowbird and smaller than the specimens of McIntosh. The maximum width of the body was in the region of the acetabulum. The spherical and subterminal oral sucker was subequal to the acetabulum. The gonads were strictly tandem in all cases. The highly convoluted uterus was mainly intracaecal and encircled the acetabulum in all the specimens. The egg masses posterior to the acetabulum were black while the anterior and lateral masses were dark brown. Figure 1 (page 24) shows the general morphology of the worm and Tables 2 and 3 (pages 27, 28) give comparison of measurements of U. dryobatae from various hosts.

Other Literature consulted: (36), (65), (77), (92), (101), (193), (104).

TABLE NO. 1

Leucochloridium melospizae: comparison of our measurements with those of McIntosh 1932. (All measurements in millimetres).

	Present Paper 1963	McIntosh 1932
Length	2.03	1.41
Maximum width	1.12	0.92
Oral Sucker	0.532 x 0.615	0.400 x 0.500
Pharynx	0.153 x 0.191	0.120 x 0.175
Ventral Sucker	0.500 x 0.566	0.420 x 0.420
Anterior Testis	0.124 x 0.163	0.070 x 0.080
Posterior Testis	0.152 x 0.169	0.100 x 0.100
Ovary	0.166 x 0.178	0.080 x 0.100
Cirrus Pouch	0.160 x 0.168	0.100 x 0.120
Eggs-range	0.018 - 0.025 x 0.013 - 0.015	
-average	0.022 x 0.014	0.022 x 0.017

TABLE NO. 2

Urogonimus dryobatae: Comparison of measurements from various hosts.

(All measurements in mm.)

	<u>From Dumetella</u> <u>carolinensis</u> <u>(Manitoba)</u>	<u>Molothrus</u> <u>ater ater</u> <u>(Manitoba)</u>	Type Specimens (McIntosh 1932)
Length	1.73	2.06	2.19
Maximum width	0.82	1.06	1.28
Oral Sucker	0.453 x 0.494	0.536 x 0.567	0.480 x 0.560
Pharynx	0.156 x 0.189	0.183 x 0.233	0.170 x 0.250
Acetabulum	0.465 x 0.510	0.561 x 0.603	0.570 x 0.620
Anterior Testis	0.126 x 0.155	0.172 x 0.226	0.160 x 0.200
Posterior Testis	0.135 x 0.158	0.175 x 0.211	0.140 x 0.190
Ovary	0.138 x 0.169	0.168 x 0.222	0.170 x 0.220
Eggs-Range	0.023 - 0.027 x	0.020 - 0.029 x	-
	0.014 - 0.020	0.014 - 0.019	
-Average	0.025 x 0.017	0.024 x 0.017	0.025 x 0.018

TABLE NO. 3

Urogonimus dryobatae: Comparison of range of measurements from two different hosts. (Present paper)

(All measurements in mm.)

	Range from <u>Dumetella</u> <u>carolinensis</u>	Range from <u>Molothrus</u> <u>ater ater</u>
Length	1.63 - 1.86	1.79 - 2.21
Maximum width	0.78 - 0.86	0.80 - 1.56
Oral Sucker	0.418 - 0.500 x 0.475 - 0.510	0.500 - 0.570 x 0.538 - 0.593
Pharynx	0.122 - 0.201 x 0.169 - 0.206	0.129 - 0.202 x 0.210 - 0.248
Acetabulum	0.420 - 0.500 x 0.475 - 0.540	0.500 - 0.633 x 0.565 - 0.638
Anterior Testis	0.113 - 0.137 x 0.152 - 0.229	0.152 - 0.198 x 0.180 - 0.257
Posterior Testis	0.107 - 0.152 x 0.139 - 0.196	0.152 - 0.189 x 0.180 - 0.257
Ovary	0.122 - 0.152 x 0.152 - 0.198	0.128 - 0.192 x 0.196 - 0.244
Eggs	0.023 - 0.027 x 0.014 - 0.020	0.020 - 0.029 x 0.014 - 0.019

PLATE II.

Fig. 4. Conspicuum icteridorum from Quiscalus
quiscula versicolor. Ventral View.
x20.

Fig. 5. Leucochloridium melospizae from
Melospiza melodia juddi. Ventral View.
x44.

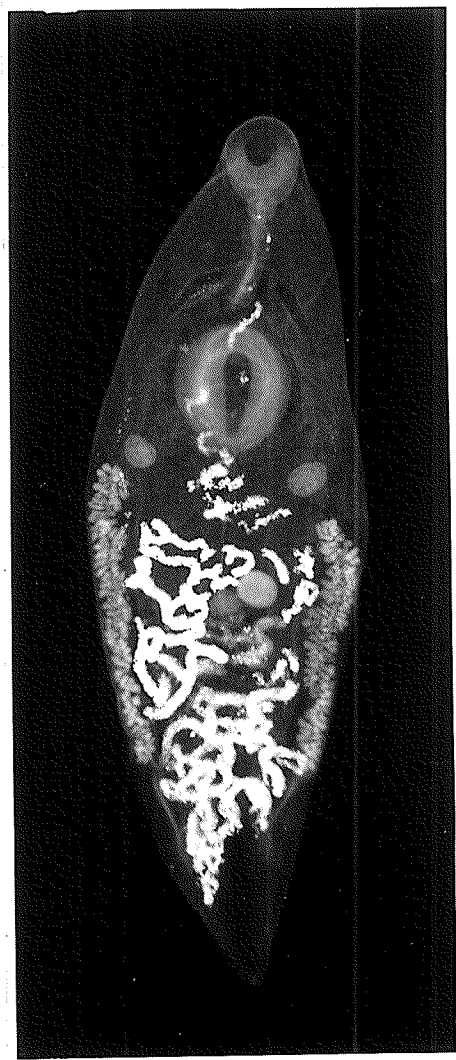


Fig. 4



Fig. 5

Family Dicrocoeliidae Odhner, 1910

Subfamily Dicrocoeliinae Looss, 1899

Genus Conspicuum Bhalerao, 1936

Conspicuum macrorchis Denton and Byrd, 1951

(Figure 7)

The swollen gall-bladder of a female Redwinged Blackbird (Agelaius phoeniceus phoeniceus) shot near Norris Lake on July 18, 1962 yielded ten specimens of Conspicuum macrorchis. The material collected conformed to the description of the type specimens from the Common Crow. Our finding constitutes therefore a new host and new locality record.

The body was elongated, thick and muscular and either slightly pointed posteriorly or bluntly ending, with the greatest width in the region of the gonads. Our specimens were slightly smaller than the type specimens of Denton and Byrd (24). The oral sucker was almost terminal to subterminal. The acetabulum was large, about twice the size of the oral sucker, and situated in the anterior third of the body. The intestinal caeca made contact with the testes, terminating about half-way between the posterior end of the vitellaria and the posterior end of the body. The gonads were approximately equal in size to the oral sucker. The testes were smooth, rounded, in contact with the caeca, and located at the level of the posterior end of the acetabulum. The size of the testes

varied individually from smaller to larger than the ovary. The ovary was rounded, median to submedian, smooth or slightly lobed, directly anterior to the circular seminal receptacle and Mehlis' gland and posterior to the testes. The cirrus pouch was elongated, oval, and extended from the pharynx to the acetabulum. The vitellaria, with medium sized follicles, were basically extracaecal and about one third the length of the body. The uterus was much convoluted, intracaecal with the loops occupying the greater part of postacetabular region. It ran a wavy course from the posterior region to the gonopore which was ventral to the pharynx. The eggs were packed tight in the uterus and ranged in size from 0.027 to 0.036 mm. long by 0.017 to 0.023 mm. wide. The range of variability was thus wider than that of eggs from the type specimens (0.027 to 0.031 mm. by 0.019 to 0.021 mm.).

Comparison of measurements of our material with those of the type specimens is given in Table 4 (page 35).

Conspicuum icteridorum Denton and Byrd, 1951

(Figure 4)

A male Common Grackle (Quiscalus quiscula versicolor) was shot on September 27, 1962 near Lockport Lagoon and the gall-bladder was found to contain two specimens of Conspicuum icteridorum. This is a new locality report.

The elongated and oval body tapered to the posterior end. Its maximum width was at the level of the testes. Sensory papillae were visible on the inconspicuous dorsal lip-like projection and along the lateral margins of the oral sucker. The ratio of the diameter of the oral sucker to that of the acetabulum was about 1:1.5; the oral sucker was almost terminal, and the ventral sucker was located at the posterior end of the anterior third of the body. The oesophagus was slender with the caecal bifurcation mid-way between the pharynx and the acetabulum; the ends of the caeca were located mid-way between the posterior level of the vitellaria and the posterior end of the body. The cylindrical cirrus pouch was situated between the acetabulum and the pharynx; the gonopore was ventral to the pharynx. The testes were smooth, spherical and intracaecal, immediately posterior to the acetabulum, and slightly smaller than the ovary in all cases. The ovary was smooth, almost circular, submedian, and posterior to the testes. The vitellaria, with medium sized follicles, were posterior to the testes and occupied approximately a third of the body length. The size of the operculate eggs was 0.020 by 0.027 mm.

Table 5 (page 36) compares the measurements of the type specimens to those of our specimens.

Genus Zonorchis Travassos, 1944

Zonorchis alveyi (Martin and Gee, 1949)

(Figure 6)

Two specimens of this trematode were recovered from the gall-bladder of a female White-throated Sparrow (Zonotrichia albicollis) which was killed in Lockport marshes on September 25, 1962. Two other birds, shot two days and a week later in the same area, yielded no worms. Our material agreed very closely with the type specimens of Eurytrema alveyi described by Martin and Gee (48) and placed by Denton and Byrd (24) into the genus Zonorchis. This is a new locality record for this trematode.

Our larger specimen was 5.85 mm. long, thus slightly longer than the type specimens - 5.42 mm. The small protruberances reported by Martin and Gee on the cuticula of the anterior body region were not observed in the mounted specimens. The ratio of the diameter of the oral sucker to that of acetabulum was about 1:2. The oral sucker was subterminal and the acetabulum was located at the posterior end of the anterior third of the body. The oesophagus was slender and the caecal bifurcation was mid-way between the two suckers. The genital pore was located ventrally at the level of the pharynx. The testes were oval to spherical, smooth, immediately laterally posterior to the acetabulum and anterior to the median ovary. The ovary was smooth to slightly lobed - that of the type specimen was distinctly lobed - and in all cases larger than the testes. The vitellaria had medium sized follicles and extended from the posterior end of the acetabulum to the posterior third of the

body. The uterus was highly convoluted and filled most of the postacetabular region of the body with some of the loops overlapping and masking the vitellaria. The mature egg masses anterior to the ovary were dark brown, the posterior - light brown. The average size of the eggs (0.020 by 0.030 mm.) was almost identical with that from the type specimens (0.020 by 0.031 mm.).

Table 6 (page 37) shows measurements of our specimens compared with those of the type specimens.

Other Literature consulted: (7), (23), (71).

Table No. 4

Conspicuum macrorchis: Comparison of measurements of our material with those of the type specimens.

	Our material from <u>Agelaius phoeniceus</u>		Type specimens
	Average	Range	Range
Length	3.70	2.68 - 4.38	4.27 - 5.47
Maximum Width	1.54	1.36 - 1.69	1.40 - 2.04
Oral Sucker	0.347 x 0.365	0.250-0.395 x 0.285-0.408	0.30 - 0.50 (diameter)
Pharynx	0.153 x 0.165	0.110-0.177 x 0.128-0.187	0.14 - 0.24 (diameter)
Acetabulum	0.737 x 0.754	0.660-0.810 x 0.685-0.815	0.55 - 0.84 (diameter)
Left Testis	0.265 x 0.312	0.185-0.305 x 0.244-0.389	0.25 - 0.77 (greatest dia.)
Right Testis	0.247 x 0.318		
Ovary	0.285 x 0.363	0.225-0.305 x 0.280-0.438	0.30 - 0.37 (width)
Vitellaria	1.38	0.85 - 1.89	1.73 - 2.28
Eggs	0.032 x 0.021	0.027-0.036 x 0.017-0.023	0.027-0.031 x 0.019-0.021

TABLE NO. 5

Conspicium icteridorum: Comparison of our material with the type specimens.

(All measurements in mm.)

	Our Material		Type Specimens
	Specimen 1	Specimen 2	
Length	5.65	5.40	2.20 - 5.97
Maximum Width	1.85	1.84	0.70 - 1.97
Oral Sucker	0.50 x 0.55	0.46 x 0.54	0.20 - 0.58 (diameter)
Pharynx	0.16 x 0.19	0.17 x 0.20	0.08 x 0.23 (diameter;
Ventral Sucker	0.75 x 0.78	0.75 x 0.80	0.38 x 0.82 (diameter)
Left Testis	0.20 x 0.21	0.20 x 0.25	0.09 - 0.45 (diameter)
Right Testis	0.19 x 0.25	0.21 x 0.23	
Ovary	0.25 x 0.27	0.25 x 0.30	0.10 - 0.36 (diameter)
Vitellaria	1.63 & 1.94	1.50 & 1.81	0.82 - 2.11 (length)
Eggs (Range)	0.025 - 0.030 x 0.017 - 0.023		0.027-0.033 x 0.017-0.023

TABLE No. 6

Zonorchis alveyi: Comparison of our material with the type specimens. (All measurements in mm.).

	Specimen 1	Specimen 2	Range	Type Specimens (Martin & Gee, 1949)
Length	4.80	5.85	4.80-5.85	2.61-4.67
Maximum Width	1.75	1.71	1.71-1.75	1.13-1.84
Oral Sucker	0.25x0.36	0.42x0.43	0.25-0.42 x 0.36-0.43	0.345 (diameter)
Pharynx	0.11x0.15	0.17x0.18	0.11-0.17 x 0.15-0.18	0.06-0.15 x 0.13-0.24
Acetabulum	0.58x0.61	0.56x0.58	0.56-0.58 x 0.58-0.61	
Right Testis	0.36x0.38	0.25x0.32	0.26-0.36 x	0.14-0.26 x
Left Testis	0.31x0.39	0.26x0.30	0.30-0.39	0.15-0.32
Ovary	0.35x0.45	0.37x0.43	0.35-0.37 x 0.43-0.45	0.23-0.39 x 0.29-0.41
Vitellaria (Right)	2.39	2.95	2.39-3.05	-
(Left)	2.75	3.05		
Eggs	-	-	0.026-0.033 x 0.018-0.022	0.029-0.033 x 0.0187-0.022

PLATE III.

Fig. 6. Zonorchis alveyi from Zonotrichia
albicollis. Ventral View. x23.

Fig. 7. Conspicuum macrorchis from Agelaius
phoeniceus phoeniceus. Ventral
View. x30.

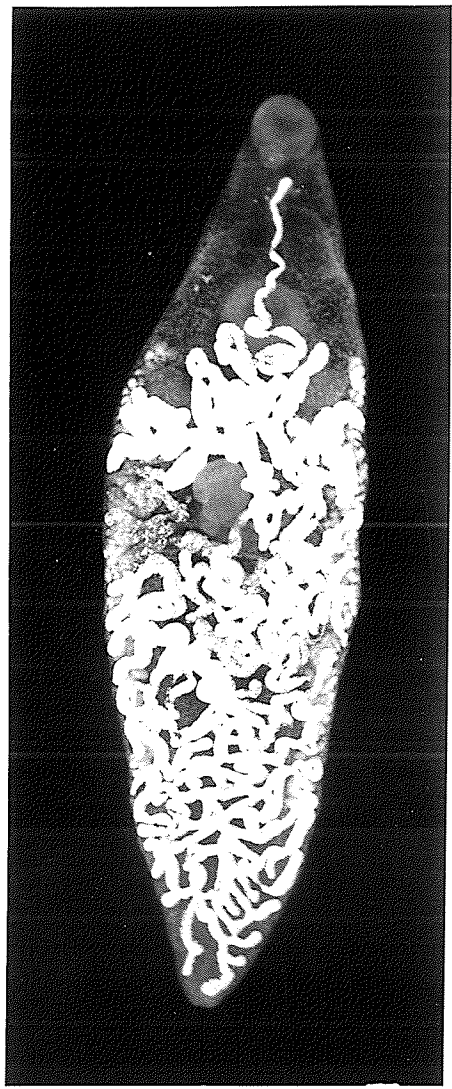


Fig. 6



Fig. 7

Family Plagiorchiidae Ward, 1917

Subfamily Plagiorchiinae Pratt, 1902

The Genus Plagiorchis Lühe, 1899

Far too many species of the genus Plagiorchis have been described and as a result the existing keys are unsatisfactory for identification. It is highly probable that the descriptions of many species of the genus are based on individually variable characters. This is why the writer strongly feels that many of the "species" do not exist. Oisen (67) on the basis of presence of a seminal receptacle, removed Plagiorchis noblei from the genus and created a new genus - Plagiorchoides with P. noblei as the sole species.

In our material two species of the genus Plagiorchis and one of the genus Plagiorchoides were present.

Plagiorchis gonzalchavezzi Zerecero, 1949

Six specimens of this trematode were obtained from the lower portion of the small intestine of a male Eastern Kingbird (Tyrannus tyrannus) shot near Francis Beach of Lake Manitoba, on July 30, 1962. Our specimens were smaller than the type specimens from Tyrannus sp. in Mexico.

The body was elongate and slightly attenuated toward both ends; the length ranged from 1.80 to 2.00 mm. (average, 1.88 mm.). The maximum width, located at the region of the gonads, was 0.37 to 0.50 mm. (average 0.44 mm.). The ratio of the body length to the maximum width was 4.27:1. The cuticle was

covered with fine spines from the anterior end to the level of the testes. The oral sucker was subterminal, larger than the acetabulum and measured 0.195 to 0.206 mm. by 0.177 to 0.190 mm. (average 0.201 by 0.185 mm.). A short prepharynx was present. The pharynx measured 0.082 to 0.092 mm. by 0.068 to 0.076 mm. (average, 0.087 by 0.074 mm.). The acetabulum was situated near the anterior end of the middle third of the body and measured 0.125 to 0.145 mm. by 0.117 to 0.125 mm. (average, 0.136 by 0.122 mm.). The testes were globular, subequal with the posterior testis always larger than the anterior, and situated obliquely in anterior portion of the posterior half of the body. The testes were regularly larger than the ovary, the oral sucker, and the acetabulum. The size of the anterior testis ranged from 0.202 to 0.253 mm. by 0.190 to 0.204 mm. (average, 0.228 by 0.197 mm.), and the posterior testis 0.220 to 0.272 mm. by 0.190 to 0.208 mm. (average, 0.242 by 0.199 mm.). The cirrus pouch was prominent, semilunar and surrounded the acetabulum; its length measured in a straight line was 0.210 to 0.365 mm. (average, 0.280 mm.). The seminal vesicle was divided into a short anterior and a long posterior portion; its total length was 0.109 to 0.145 mm. (average, 0.129 mm.). The gonopore was situated close to the anterior region of the acetabulum. The ovary was globular, larger than the acetabulum and measured 0.186 to 0.191 mm. by 0.160 to 0.187 mm. (average, 0.189 by 0.177 mm.). The vitellaria extended from the region of the pharynx to the posterior end of the body; the anterior limit of the follicles was variable. The follicles

were medium sized, extracaecal and overlapped the caeca; they did not fuse anteriorly - except in one worm - and posteriorly. The size of the eggs ranged from 0.030 to 0.038 mm. by 0.018 to 0.024 mm. (average, 0.035 by 0.022 mm.).

Table 7 (page 43) compares our material with the type specimens, and Figures 8 and 9 (page 44) show variations in the morphology of the trematode.

Plagiorchis gonzalchavezii (?)

24 specimens of this trematode were collected from the lower portion of the small intestine of a female Redwinged Blackbird (Agelaius phoeniceus phoeniceus) killed near Francis Beach of Lake Manitoba on July 30, 1962.

The present species closely resembles Plagiorchis gonzalchavezii but differs from it in its smaller size and in having fewer eggs and coils of the descending loop of the uterus. It is almost certain that these characters are the result of crowding (the host had 24 specimens of this trematode in its intestine) and that our trematode is P. gonzalchavezii.

The body was elongated and slightly attenuated at both ends; it was 1.16 (1.00 to 1.31) mm. long and 0.31 (0.28 to 0.34) mm. wide. The cuticle was non-spinose. The oral sucker was subterminal, definitely larger than the acetabulum, 0.163 (0.147 to 0.177) mm. long by 0.150 (0.134 to 0.177) mm.

wide. The acetabulum was subequal to the ovary and located 0.46 (0.41 to 0.50) mm. from the anterior end of the body; it measured 0.089 (0.085 to 0.099) mm. by 0.082 (0.076 to 0.085) mm. A preparynx was present; the pharynx was 0.071 (0.068 to 0.076) mm. long by 0.061 (0.056 to 0.065) mm. wide. A short oesophagus was present, but indistinct in some specimens. The excretory pore was terminal. The cirrus sac was well developed, 0.183 to 0.229 mm. long, and surrounded the acetabulum as a crescent; the seminal vesicle, within the posterior portion of the cirrus sac, was 0.076 to 0.084 mm. long and divided into two portions by a constriction. The testes were globular, postequatorial, subequal, and obliquely one behind the other. They were larger than the ovary and smaller than the oral sucker. The anterior testis was 0.124 (0.100 to 0.141) mm. long by 0.116 (0.100 to 0.125) mm. wide; the posterior testis 0.131 (0.101 to 0.152) mm. long by 0.116 (0.099 to 0.125) mm. wide. The ovary was globular, subequatorial, subequal to the acetabulum, and measured 0.097 (0.076 to 0.109) mm. by 0.092 (0.076 to 0.102) mm. The descending loop of the uterus reached near to the posterior end of the body and contained very few eggs which measured 0.033 (0.030 to 0.036) mm. by 0.022 (0.019 to 0.025) mm. The vitellaria extended from the region of intestinal bifurcation to the posterior end of the body. The follicles were extracaecal, overlapped the caeca and were medium sized.

Figure 11 (page 50) is a photomicrograph of this worm.

TABLE NO. 7

Plagiorchis gonzalchavezii: Comparison of measurements from two sources.

(All measurements in mm.)

	Our Material from <u>Tyrannus tyrannus</u>		Type Specimens of Zerecero, 1949
	Range	Average	
Length	1.80-2.00	1.88	2.289
Maximum Width	0.37-0.50	0.44	0.594
Oral Sucker	0.195-0.206 x 0.177-0.190	0.201x0.185	0.213x0.204
Pharynx	0.082-0.092 x 0.068-0.076	0.087x0.074	0.097x0.113
Acetabulum	0.125-0.145 x 0.117-0.125	0.136x0.122	0.160x0.155
Testis (anterior)	0.202-0.253 x 0.190-0.204	0.228x0.197	0.244 (diameter)
Testis (posterior)	0.220-0.272 x 0.190-0.208	0.242x0.199	0.284x0.235
Ovary	0.186-0.191 x 0.160-0.187	0.189x0.177	0.195x0.191
Eggs	0.030-0.038 x 0.018-0.024	0.035x0.022	0.040x0.023

PLATE IV.

Fig. 8. Plagiorchis gonzalchavezi with the vitellaria extending to the level of the pharynx. Ventral View. x67.

Fig. 9. P. gonzalchavezi with the vitellaria extending to the level of the oral sucker. Ventral view. x67.

Plagiorchoides noblei (Park, 1936) Olsen, 1937

(Figures 12 and 13)

19 specimens (10 males and 9 females) of the Redwinged Blackbird (Agelaius phoeniceus phoeniceus) shot near Norris Lake, Long Lake, Lake Manitoba and Lockport in July and October 1962 contained a total of 87 specimens of Plagiorchoides noblei. A total of 10 worms were collected from 9 specimens (3 males and 6 females) of the Yellow-headed Blackbird (Xanthocephalus xanthocephalus) shot near Norris and Long Lakes in July of the same year. A male Baltimore Oriole (Icterus galbula) killed near Libau marshes on August 14, 1962, yielded 3 specimens; and a male Warbling Vireo (Vireo gilvus gilvus) killed near Norris Lake on the 3rd. of August contained 2 worms. The worms were recovered from the lower and middle portions of the small intestine and in one case from the rectum. These are the first reports of Plagiorchoides noblei from the Yellow-headed Blackbird, the Baltimore Oriole, and the Warbling Vireo. Table 8 (page 47) summarizes our findings of this trematode in different host.

Measurements included in the following description are those of specimens from Redwinged Blackbirds. A comparative table (No. 10, page 49) was compiled for measurements based on materials from other birds.

The body was elongated, slightly attenuated anteriorly and pointed posteriorly; 2.53 (1.70 to 3.88) mm. long by 0.63 (0.45 to 0.83) mm. wide. The cuticula was covered with minute

spines which were more numerous at anterior third of the body. The spherical oral sucker, slightly larger than the ventral sucker, was 0.230 (0.168 to 0.288) mm. long by 0.217 (0.164 to 0.267) mm. wide. The ventral sucker was preequatorial and 0.201 (0.152 to 0.253) mm. by 0.190 (0.147 to 0.248) mm. A prepharynx was not visible in any of the specimens examined; the pharynx was 0.116 (0.084 to 0.150) mm. by 0.129 (0.090 to 0.169) mm. The excretory pore was ventral, posterior and subterminal. The cirrus pouch was prominent and formed a crescent laterally or dorsally around the ventral sucker; a constricted seminal vesicle was contained in the posterior part of the pouch and the cirrus carried minute spines. The testes were globular, obliquely placed, and postequatorial but in a few specimens subequatorial. The anterior testis, slightly smaller than the posterior, was 0.237 (0.145 to 0.318) mm. long by 0.201 (0.114 to 0.306) mm. wide; the posterior testis 0.264 (0.168 to 0.340) mm. by 0.209 (0.134 by 0.305) mm. The ovary was 0.197 (0.145 to 0.257)mm. long by 0.175 (0.126 to 0.238) mm. wide; the seminal receptacle was invisible in most of the specimens. The vitellaria extended anteriorly to the level of the ventral sucker and posteriorly near the posterior end of the body. The operculated eggs measured 0.031 (0.027 to 0.036) mm. by 0.019 (0.017 to 0.024) mm.

Table 9 (page 48) summarizes measurements of this trematode from different birds.

Other literature consulted: (46), (49), (62), (68), and (105).

Table No. 8

Plagiorchoides noblei: Collected from various hosts.

Host	Number of Hosts Examined	Number of Hosts Infected	% Incidence	Total Worms Collected	Number of Individuals (Range)	Average Worms per Bird
<u>Agelaius</u> <u>phoeniceus</u>	19	10	52.6	87	1-49	4.58
<u>Xanthocephalus</u> <u>xanthocephalus</u>	9	5	55.6	14	1-10	1.56
<u>Icterus</u> <u>galbula</u>	2	1	50.0	3	3	1.5
<u>Vireo</u> <u>gilvus gilvus</u>	1	1	100.0	2	2	2

Table No. 9

Plagiorchoides noblei: Comparison of measurements from two localities.
(All measurements in mm.).

	From <u>Agelaius phoeniceus</u> (Present paper)		Type Specimens. (Park, 1936)	
	Range	Average	Range	Average
Length	1.70 - 3.88	2.53	1.34 - 3.28	2.21
Max. Width	0.45 - 0.83	0.63	0.332 - 0.894	0.572
Oral Sucker	0.168-0.288 x 0.164-0.169	0.230 x 0.217	0.144-0.280 x 0.136-0.252	0.197 x 0.181
Pharynx	0.084-0.160 x 0.090-0.169	0.116 x 0.129	0.056-0.124 x 0.072-0.152	0.098 x 0.104
Acetabulum	0.152-0.253 x 0.147-0.248	0.201 x 0.190	0.116-0.232 x 0.108-0.228	0.164 x 0.152
Testis (anterior)	0.145-0.318 x 0.114-0.306	0.237 x 0.201	0.128-0.316 x 0.100-0.320	0.204 x 0.182
Testis (pos)	0.168-0.340 x 0.134-0.305	0.264 x 0.209	0.144-0.372 x 0.112-0.344	0.229 x 0.187
Ovary	0.145-0.257 x 0.126-0.238	0.197 x 0.175	0.084-0.268 x 0.080-0.252	0.161 x 0.141
Eggs	0.027-0.036 x 0.017-0.024	0.031 x 0.019	-	0.0326 x 0.0195

Table No. 10

Plagiorchoides noblei: Comparison of measurements from three different hosts. (All measurements in mm.).

	<u>Xanthocephalus</u> <u>xanthocephalus</u> (Present paper)	<u>Icterus</u> <u>galbula</u> (Present paper)	<u>Vireo</u> <u>gilvus gilvus</u> (Present paper)
Length	1.50 - 1.60	2.04 - 2.35	2.47 - 2.68
Max. Width	0.41 - 0.47	0.64 - 0.79	0.72 - 0.77
Oral Sucker	0.160-0.171 x 0.152	0.264-0.267 x 0.229	0.235-0.244 x 0.229-0.236
Pharynx	0.090-0.103 x 0.090-0.091	0.113-0.135 x 0.113-0.118	0.117-0.119 x 0.110-0.114
Acetabulum	0.143-0.145 x 0.128-0.139	0.192-0.221 x 0.181-0.190	0.204-0.213 x 0.194-0.200
Testis (ant)	0.160-0.175 x 0.152-0.165	0.206-0.289 x 0.192-0.251	0.305-0.322 x 0.244
Testis (pos)	0.169-0.187 x 0.166-0.174	0.240-0.305 x 0.204-0.250	0.328-0.335 x 0.229-0.251
Ovary	0.137-0.142 x 0.116-0.133	0.206-0.245 x 0.180-0.216	0.202-0.214 x 0.185-0.196
Eggs	0.030-0.033 x 0.018-0.020	0.027-0.032 x 0.017-0.019	0.030-0.038 x 0.017-0.021

PLATE V.

Fig. 10. Echinoparyphium sp. from
Dumetella carolinensis.
Ventral View. x67.

Fig. 11. Plagiorchis gonzalchavezii (?)
from Agelaius phoeniceus phoeniceus.
Ventral View. x67.

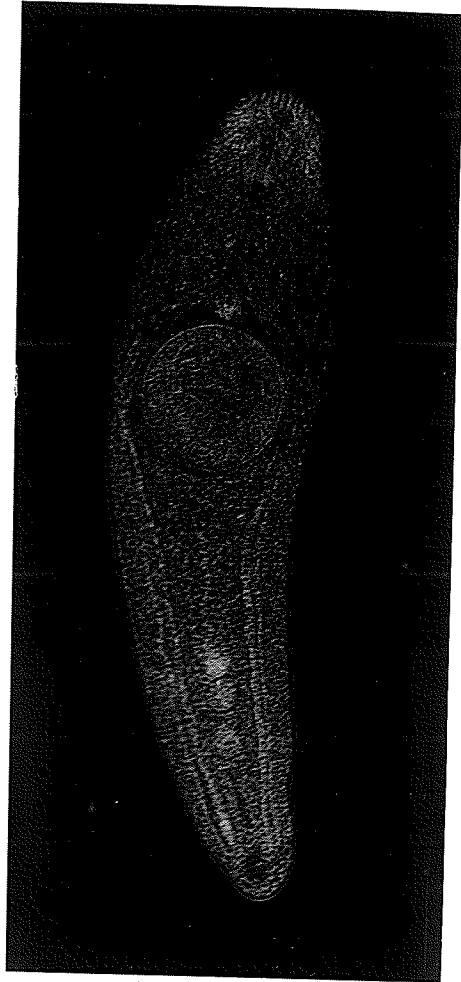


Fig. 10



Fig. 11

Family Echinostomatidae Looss, 1902, emend. Poche,
1926 or Stiles and Hassall, 1926

Subfamily Echinostomatinae Looss, 1899, emend.
Stiles and Hassall, 1926

Genus Echinoparyphium Dietz, 1910

Echinoparyphium sp.

A single immature specimen of this trematode was collected from the lower part of the small intestine of a female Catbird (Dumetella carolinensis) shot near Norris Lake on August 3, 1962. Another female bird examined on the same day contained no worms.

The length of the body was 1.56 mm. and its maximum width (located immediately anterior to acetabulum) 0.38 mm. The postacetabular region tapered gradually till it terminated bluntly. Tiny cuticular spines extended almost to the posterior end of the body. The reniform head collar (0.021 mm. wide) carried 37 stout spines unbroken dorsally; 5 on each side were "corner spines", the remaining 27 being arranged in two rows. The oral sucker measured 0.091 by 0.103 mm.; the pharynx 0.071 by 0.076 mm. A prepharynx and a long oesophagus were present. The long intestinal caeca terminated near the posterior end of the body and were not covered by the acetabulum, which was powerfully developed and measured 0.271 by 0.292 mm. The ratio of the diameter of the oral sucker to that of the acetabulum was 1:2.

The reproductive organs were immature. The anterior and posterior testes were tandem, ovoid, and equal in size, with a diameter of 0.060 mm. The cirrus pouch was rounded and located between the acetabulum and the intestinal bifurcation. The ovary was slightly lobed and median, being anterior to, in line with, and smaller than the testes. The uterus had a wavy ascending limb and contained no ova. The vitellaria were postacetabular and under-developed.

The morphology of the worm is shown in Figure 10 (page 50).

Literature consulted: (4), (9), (25), (37), (38), (50).

PLATE VI.

Fig. 12. Plagiorchoides noblei from Vireo
gilvus gilvus. Ventral View. x50.

Fig. 13. P. noblei from Agelaius phoeniceus
phoeniceus. Ventral View. x50.



Fig. 12



Fig. 13

NOTES ON CESTODES

Family Davaineidae Fuhrmann, 1907

Subfamily Davaineinae Braun, 1900

Genus Raillietina Fuhrmann, 1920

Raillietina tetragona (Molin, 1858) Joyeux, 1927

A single specimen of this tapeworm was recovered from the rectum of a female Ruffed Grouse (Bonasa umbellus umbelloides) shot near Norris Lake on July 23, 1962. Two other birds shot later - one near Norris Lake and the other in the Libau marshes - contained no worms of this species. A detailed description of this cestode was given by Boughton (10).

The testes were numerous (27 to 33); in a few immature and enlarged segments near the anterior region the number rose to between 50 and 55. The cirrus pouch was pyriform; and the gonopores alternated irregularly.

The measurements of our specimen were as follows: length - 100 mm.; maximum width - 1.25 mm.; scolex - 0.215 by 0.382 mm.; rostellum - 0.067 mm. in diameter; and the diameter of the suckers ranged from 0.094 to 0.102 mm. by 0.129 to 0.141 mm.

Figures 14 and 15 (page 55) show the scolex and the mature segments of this cestode.

Other Literature consulted: (80).

PLATE VII

Fig. 14. Mature segments of Raillietina
tetragona. x65.

Fig. 15. Scolex of R. tetragona. x65.

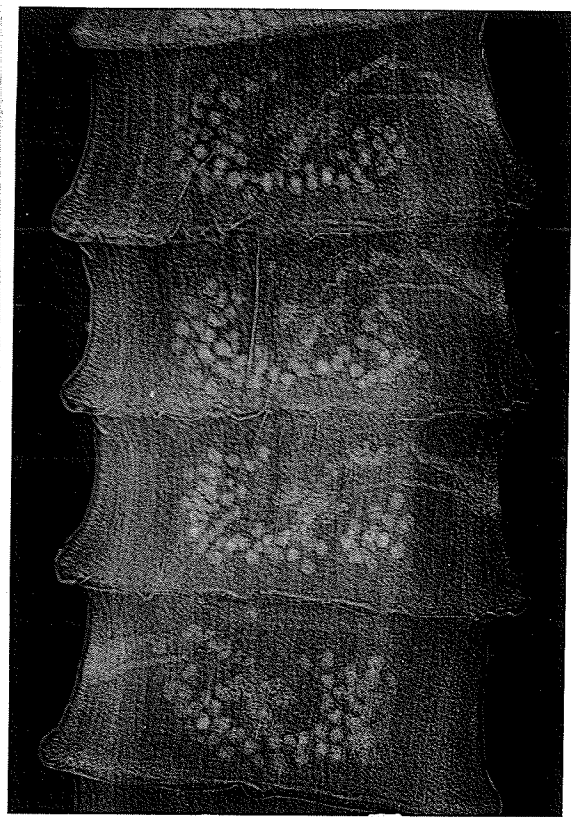


Fig. 14

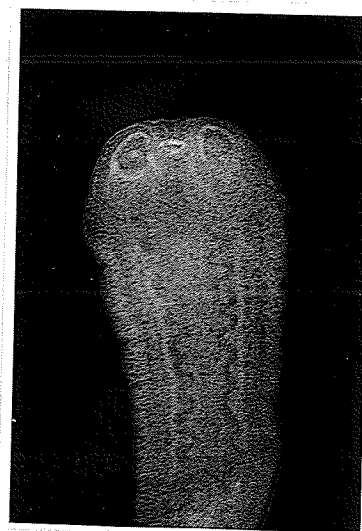


Fig. 15

Family Hymenolepididae Railliet and Henry, 1909

Subfamily Hymenolepidinae Perrier, 1897

Genus Hymenolepis Weinland, 1858

The genus Hymenolepis contains at present a very large number of species. The literature concerned is extensive and confusing. Many attempts to subdivide this genus have been made but with little success. Mayhew (57) has proposed to subdivide this genus into Hymenolepis (sensu stricto), Weinlandia gen. n. and wardium gen. n. This classification was questioned by Baer (5), Meggit (61), and Joyeux (40), and now generally discarded. Hughes (34) has published detailed review of this genus and (35) has given a key for all species of the genus, including doubtful ones.

Two species of this genus were found in our material.

Hymenolepis corvi (Mayhew, 1925) Fuhrmann, 1932

Two specimens of this species were collected from the lower portion of the small intestine of a male Common Crow (Corvus brachyrhynchos brachyrhynchos) shot near Norris Lake on July 26, 1962.

The length of the two specimens were 120 and 135 mm., about twice as long as the largest of the type specimens. This discrepancy in length might be explained by the fact that Mayhew probably has not had individuals with gravid segments; at least, he has not reported such. The scolex was broad and

0.21 mm. in width. The suckers were prominent, extended, and spherical to oval. The rostellum was retracted, its sac measuring 0.058 by 0.145 mm. There were 10 slender rostellar hooks with a long handle and short pointed blade equal in length to the guard. They were slightly smaller than the hooks of the type specimens. The neck was slender and in one specimen was beaded. The proglottids were trapezoid; the anterior ones broader than long, gradually increasing in relative length and becoming longer than broad. In the region of the mature and gravid segments they were again broader.

There were 3 testes, 2 aporal and 1 poral. They were rounded or oval and subequal. The anterior testis was either tandem or lateral to the posterior one, but never medial. The poral testis was in line with the posterior aporal one. The long, well developed cirrus pouch contained an internal seminal vesicle. The external seminal vesicle was rounded, centrally located, in line with the cirrus pouch and separated from it by a constriction. The genital apertures were unilateral and situated near the middle of the segment margin.

The lobed and well developed ovary embraced the rounded, unbranched, posterior and centrally placed vitelline gland by forming a half-loop around it. The vagina was immediately posterior to the cirrus pouch and usually overlapped by the latter. In the posterior gravid segments the sac-like uterus was restricted by the ventral longitudinal excretory vessels

and occupied the greater part of that space.

Mayhew did not report the size of eggs since gravid segments were apparently absent from his specimens. As a result all subsequent workers and writers quoted him with a question mark in place of the eggs. Both our specimens had gravid segments enabling us to take the following measurements of mature eggs: outer shell, 0.030 to 0.042 mm. by 0.035 to 0.051 mm. (average, 0.035 by 0.041 mm.); inner shell, 0.025 to 0.036 by 0.028 to 0.039 mm. (average, 0.030 by 0.034 mm.); oncosphere or embryo, 0.022 to 0.031 mm. by 0.028 to 0.034 mm. (average, 0.026 by 0.030 mm.); oncospheric hooks, 0.015 to 0.023 mm. (average, 0.018 mm.) in length.

In Table 11 (page 60) our measurements are compared to those of the type specimens.

Figures 16, 17, 18 and 19 (page 62) show the scolex, young, mature and gravid segments of this cestode.

Hymenolepis planestici (Mayhew, 1925) Fuhrmann, 1932

The description of this cestode is based on a study of 7 worms taken from the upper part of the small intestine of the Robin (Turdus migratorius migratorius) collected near Norris Lake on July 18, 1962. All the worms were slightly decomposed and only two retained their scoleces.

The length of the strobilae ranged from 12 mm. to

30 mm. and the maximum width from 0.50 to 1.75 mm. The suckers were round and prominent averaging 0.076 mm. in diameter. Maynew did not state the size of the suckers in his type specimens. The rostellum carried a single crown of 10 hooks averaging 0.014 mm. in length. The guard of the hooks was stout while the blade and the handle were thin and pointed.

The three testes were round or oval depending on the length and state of contraction of the proglottids. They formed a right-angled triangle. The anterior aporal testis was either in line with the posterior aporal or slightly displaced to the side. In some segments the anterior testis was smaller than the posterior; the two testes of this pair either separated, in contact, or overlapping. In two segments only two testes - one poral and one aporal - were found.

The ovary was lobed, median and anterior to the two posterior testes; the rounded, unlobed vitelline gland was posterior to the ovary. The genital pores were strictly unilateral and situated on the side of the single testis. The eggs were very irregular in shape; this is why only measurements of the embryos were made. Their size ranged from 0.024 to 0.034 mm. by 0.028 to 0.040 mm., averaging 0.028 by 0.032 mm.

Measurements of our specimens are compared with those of the type specimens in Table 12 (page 61).

Other literature consulted: (31), (32), (41), (45).

TABLE NO. 11

Hymenolepis corvi: Comparison of our material with the type specimens.

(All measurements in mm.)

	Our Material		Type
	Average	Range	Specimens (Mayhew, 1925)
Length	127.5	120-135	30-62
Maximum Width	1.40	1.39-1.40	0.80
Scolex Width	0.21	0.20-0.22	0.15
Suckers	0.080x0.111	0.058-0.122 x 0.103-0.122	0.080 (diameter)
Rostellar Sac	0.058x0.145	-	-
Rostellar Hooks	0.030	0.027-0.033	0.033-0.036
Neck - Length	0.47	0.40 -0.53	-
Width	0.09	0.08 -0.10	-
Eggs: Outer Shell	0.035x0.041	0.030-0.042 x 0.035-0.051	-
Inner Shell	0.030x0.034	0.025-0.036 x 0.029-0.039	-
Oncosphere	0.026x0.030	0.022-0.031 x 0.028-0.034	-
Hooks	0.018	0.015-0.023	-

Table No. 12

Hymenolepis planestici: Comparison of our specimens with type material. (All measurements in mm.).

	Our Material	Type Specimens (Mayhew, 1925)
Length	20.0 (10 - 30)	10 - 35
Maximum Width	1.0 (0.72-1.75)	0.5 - 1.5
Scolex Width	0.22 (0.21-0.23)	0.20
Suckers	0.075 (0.075-0.076)	-
Rostellar Hooks	0.014 (0.014-0.015)	0.014
Embryos	0.028 x (0.024-0.034 x) 0.032 (0.028-0.040)	0.019-0.030 x 0.028-0.040

PLATE VII.

Fig. 16. Scolex of Hymenolepis corvi from
Corvus brachyrhynchos brachyrhynchos
x 70.

Fig. 17. H. corvi. Immature segments. x 70.

Fig. 18. H. corvi. Mature segments. x 70.

Fig. 19. H. corvi. Gravid segments. x 70.

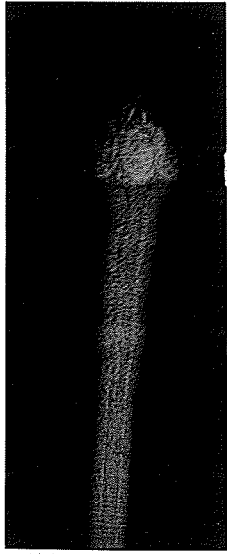


Fig. 16

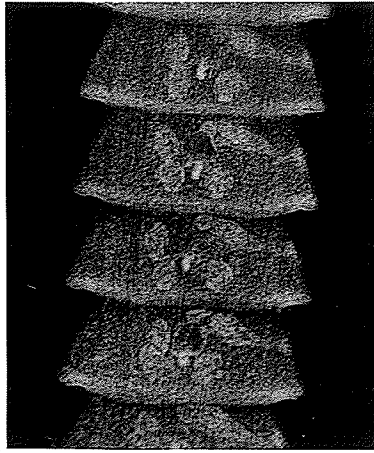


Fig. 17

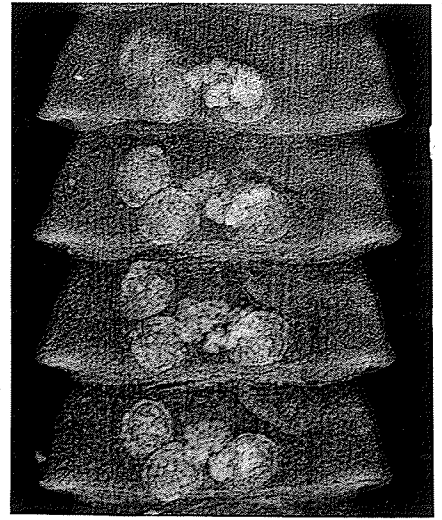


Fig. 18

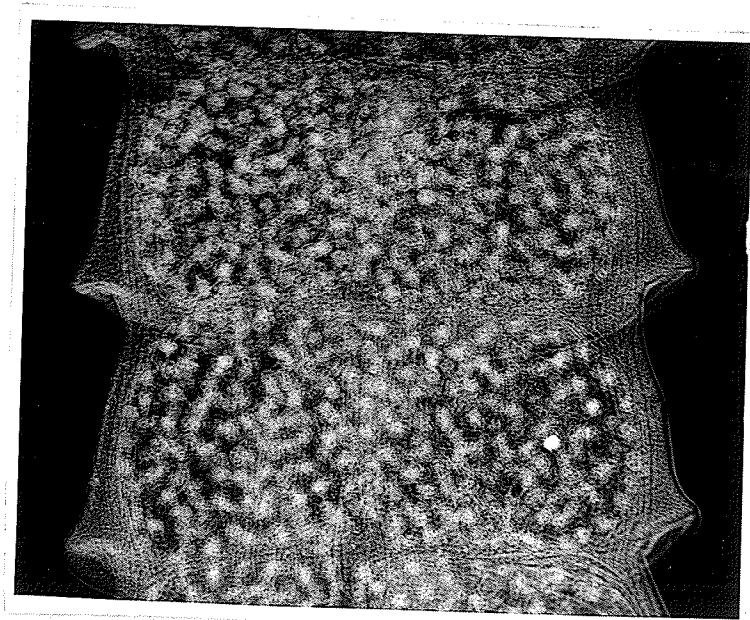


Fig. 19

Family Dilepididae Railliet and Henry, 1909,

emend. Lincicome, 1939

Subfamily Dilepidinae Fuhrmann, 1907

Genus Liga Weinland, 1857

This genus was established by Weinland (100) for small cestodes collected from the Golden-winged woodpecker (Colaptes auratus) in North America. He has described his material under the name Liga punctata. Later, in 1901, Parona (70) has described under the name of Fuhrmannia brasiliensis a cestode collected from a woodpecker (Picus) in Brazil. Ransom (72) has placed Parona's species into the genus Liga Weinland, 1857, and used the new combination, Liga brasiliensis, to designate specimens of cestodes he has collected from a Golden-winged woodpecker, Colaptes auratus from Maryland. He felt that Weinland's description of his Liga punctata was sufficient to recognize his genus Liga as a valid one, but the description of specific characters were inadequate, and therefore the species punctata has to be regarded as species inquerandum. Szpotanska (87) has published a revision of the genus Liga, and recognized 5 species parasitizing birds of various families.

Liga brasiliensis (Parona, 1901) Ransom, 1909

The specimens upon which the following description is based were collected from the upper part of the small intestine of a female Golden-winged woodpecker or Yellow-shafted flicker

(Colaptes auratus borealis) killed near the Grand Beach of Lake Winnipeg on September 20, 1962. All the 23 worms were found free in the gut lumen. A single incomplete specimen was earlier recovered from the upper portion of the small intestine of a similar bird shot near Norris Lake on July 18. This is the first report of this cestode from Manitoba.

Measurements of our specimens closely agree with those of Fuhrmann (106) and of Ransom (72). The length of the strobilae varied from 1.85 to 3.85 mm. (average, 2.9 mm.). Strobila was widest near the posterior end. The neck was completely absent and the scolex merged directly into the anterior segments which were almost as wide as the scolex. The anterior segments were broader than long but there was a gradual increase in relative length towards the posterior end of the strobila until some of the posterior segments became longer than broad. The scolex carried a well developed rostellum, either extended or retracted. The rostellar hooks numbered 20 and were arranged in two rows. Hooks of both rows were approximately equal in length.

The testes were smooth, subequal, variable in size; their number ranged from 12 to 16 (average, 15). They were concentrated in the middle field of posterior two thirds of the segments and usually overlapped one another. The cirrus pouch was oval to pyriform and the highly developed vas deferens

was coiled in the anterior portion of the segments - a trait characteristic of the species. The genital apertures alternated regularly and opened into deep depressions on the anterior third of the segment margin. The ovary was lobed and occupied the central portion of the segment, anterior to the round and smooth vitelline gland. The uterus occupied the greater portion of the posterior part of the segments except the region occupied by the coiled vas deferens. The large, lobed uterus was divided into several compartments each containing from one to four eggs. The vagina and the enlarged seminal receptacle depressed the gravid uterus, producing a deep furrow on its surface. The diameter of the oncospheres ranged from 0.024 to 0.030 mm.

Table 13 (page 66) shows the close similarity of measurements reported by three different authors.

The whole worm is shown in Figure 20 (page 67).

Table No. 13

Liga brasiliensis: Measurements of specimens from Colaptes auratus, according to different authors.
(All measurements in mm.).

	Our Material		Ransom, 1909	Fuhrmann, 1907
	Range	Average		
Length	1.85 - 3.85	2.90	3	3
Maximum Width	0.54 - 0.66	0.61	0.7	0.5
Scolex -Length	0.25 - 0.31	0.27	20	-
Width	0.26 - 0.38	0.34	40	0.39
Suckers	0.102-0.131 x 0.122-0.137	0.119 x 0.129	0.135 (dia.)	0.15 (dia.)
Rostellar Hooks				
Large	0.038 - 0.051	0.044	0.045 - 0.050	0.043
Small	0.034 - 0.046	0.039	-	0.039
Segments No.	12 -16	13	12 -15	16
Testes No.	12 -16	15	18	12 - 24
Testes Max. Size	0.076-0.091	-	0.80 - 0.10	-
Cirrus pouch	0.038-0.047 x 0.076-0.090	0.043 x 0.080	0.040-0.055 x 0.080-0.100	-
Oncosphere	0.024 - 0.030	0.026	0.026	0.027 - 0.030

PLATE IX.

Fig. 20. Liga brasiliensis from
Colaptes auratus borealis.
x30.

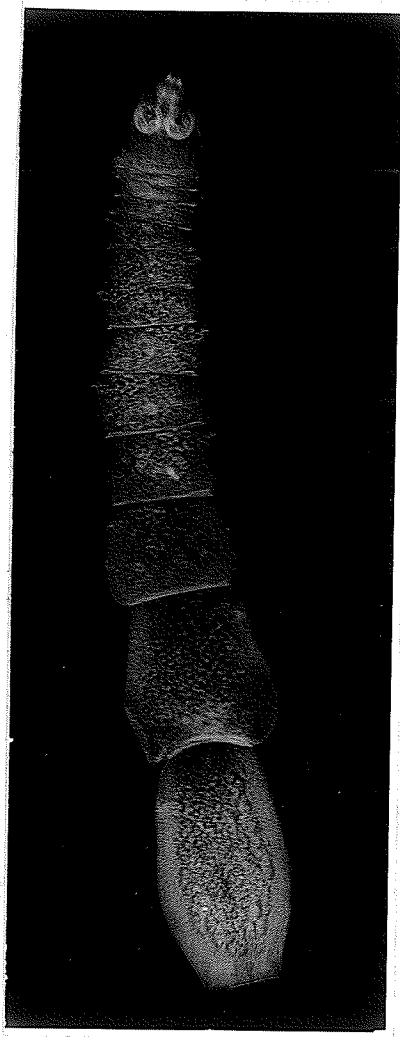


Fig. 20

Subfamily Paruterininae Fuhrmann, 1907

Genus Anonchotaenia Cohn, 1900

Anonchotaenia globata (Linstow, 1879)

23 specimens of this cestode were recovered from the upper portion of the small intestine and the duodenum of a female Brown-headed Cowbird (Molothrus ater ater) killed near Norris Lake on the 4th of July, 1962. In addition, 12 specimens of the trematode Urogonimus dryobatae were collected from the same bird. This is the first report of both species from the province of Manitoba.

The length of the worms ranged from 25 to 46 mm. (average, 31 mm.) and the maximum width 0.39 to 0.57 mm. (average, 0.48mm.). The scolex was without rostellum; the suckers were prominent and well developed. The presence or absence of a neck appeared to be a variable characteristic of the species. Cohn (18) stated that a neck was absent, segmentation beginning immediately behind the head. Fuhrmann (30) and Ransom (72) noted the presence of a neck which was either short or relatively long. Some of our specimens had a neck, while in others it seemed to be absent. The anterior segments were short; there was a gradual increase in length, and the posterior gravid segments were nearly as long as broad. The paired ventral longitudinal excretory ducts were wider than

the dorsal ones. The genital organs were medial to the ventral ducts.

The testes were rounded to oval, 5 to 7 in each segment (usually 5) arranged in a transverse row, and occasionally overlapping one another. In a segment with 5 testes, 3 were normally aporal and the other 2 poral. They ranged in size from 0.032 to 0.042 mm. by 0.035 to 0.049 mm., the average being 0.037 by 0.041 mm. The cirrus pouch was not measured since its boundaries were poorly defined. The genital apertures alternated irregularly.

The ovary was spherical, larger than the testes, centrally located, and in close proximity to the vitelline gland situated on the aporal side of the ovary. The uterus was a rounded, simple, sac-like organ. Directly in front of or antero-laterally to the uterus, in contact with it, developed a paruterine (para-uterine) organ the outer wall of which was made up of circularly running fibres. The two organs were tandem or diagonally arranged in the segments.

A comparison of measurements of Anonchotaenia globata taken by various authors is given in Table 14 (page 70). Figures 21 and 22 (page 71) represent the scolex and the gravid segments.

Other Literature consulted: (73), (78), (95), (102).

Table No. 14

Anonchotaenia globata: Comparison of measurements from various sources. (All measurements in mm.).

	From <u>Molothrus ater ater.</u> (Present paper)		From Various Hosts	From Various Hosts
	Range	Average	(Ransom, 1909)	(Voge & Davis 1953)
Length	25 - 46	31	20 - 30	-
Max. Width	0.39 - 0.57	0.48	1.0	-
Scolex Width	0.43 - 0.55	0.48	0.50 - 0.65	0.642-0.810
Suckers	0.165-0.201 x 0.177-0.213	0.184 x 0.193	0.230 (dia.)	0.157-0.173
Testes	0.032-0.042 x 0.035-0.049	0.037 x 0.041	0.030-0.040 (dia.)	0.037-0.045
Cirrus pouch	-	-	0.070-0.080 x 0.025	0.086-0.026
Ovary	0.047-0.058 x 0.058-0.068	0.054 x 0.061	0.060 (dia.)	-
Oncosphere	-	-	0.020-0.025 (dia.)	-

PLATE X.

Fig. 21. Scolex and anterior region of
Anonchotaenia globata. x65.

Fig. 22. Gravid segments of A. globata.
x65.

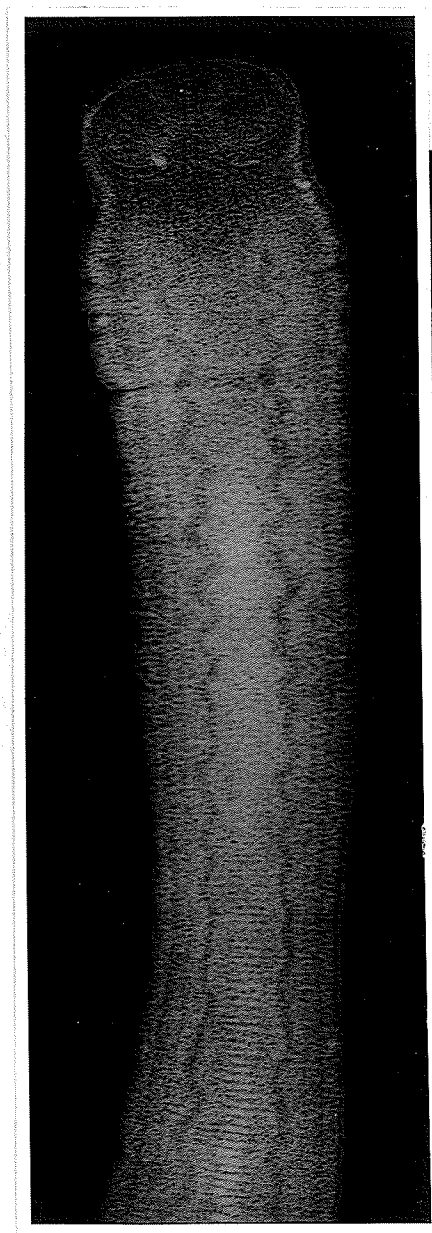


Fig. 21

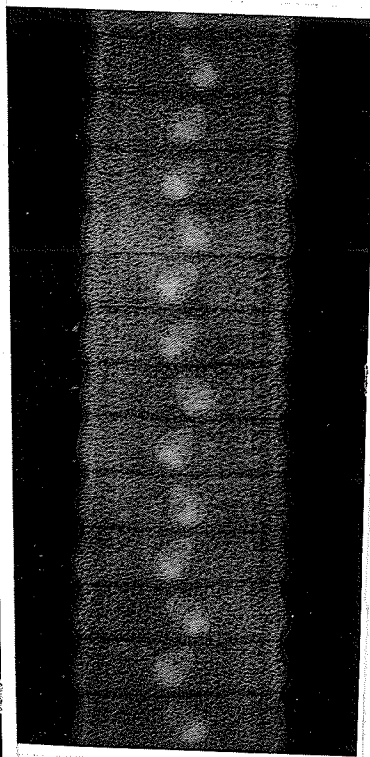


Fig. 22

NOTES ON NEMATODES

Family Trichuridae Railliet 1915

Subfamily Capillariinae Railliet, 1915

The Genus Capillaria Zeder, 1800

The genus Capillaria is cosmopolitan; its species parasitizing domestic birds are well known, but species which occur in wild birds are not sufficiently studied. Attempts to split up the genus have not proved satisfactory because no differential characters of an unvarying nature, on which to base such a division, have yet been found. Hall (33) has created a new genus Hepaticola which was based on the nature and length of the spicule sheath and the presence or absence of a spicule and bacillary bands. Baylis (8) pointed out that the spicule sheath is very variable even within a species, and therefore this character could not be relied upon. He further stated that it was not unusual to find specimens of Capillaria in which the spicule appeared to be so feebly chitinized that it was extremely difficult to detect, and it is probable that in some cases the statement that a spicule was absent might be erroneous.

Capillaria quisicali Read, 1949.

A male Common Grackle (Quiscalus quiscula versicolor) killed near Lockport Lagoon on September 27, 1962, contained a single specimen of sexually immature female Capillaria quisicali. The worm was taken from the upper portion of the

small intestine. A new locality has been reported for this nematode. The type specimens described by Read (1949) were recovered from two Bronzed Grackle (Quiscalus quiscula aeneus) collected at Madison, Wisconsin. Later, Mawson (52) reported this nematode from the European Starling from Montreal Island.

The cuticle of our specimen was transversely striated and bacillary bands were absent. The body length was 9.50 mm., and its maximum width 0.076; the width of the body immediately posterior to the vulva was 0.065 mm. The vulva, bearing a well developed funnel-shaped appendage, was located at a distance of 3.50 mm. from the anterior end. The vulva divided the body 1:1.7. The posterior end was rounded and the anus subterminal. The ovary and the uterus were immature and contained scattered groups of cells.

Table 15 (page 75) shows measurements of specimens from the same host from two localities.

Capillaria tridens (Dujardin, 1845)

A single male nematode identified as Capillaria tridens was recovered from the upper part of the small intestine of a male Eastern Towhee (Pipilo erythrophthalmus erythrophthalmus) killed near Norris Lake on July 26, 1962.

The only report of this worm from North America was that by Read (75) who recorded it from a Redwinged Blackbird, Agelaius phoeniceus, at Prairie du Sac, Wisconsin.

The length of the specimen was 18.5 mm. and its maximum width 0.069 mm. The cuticle was transversely striated, bacillary lines absent, and the mouth simple. The posterior end of the oesophagus was at a distance of 8.25 mm. from the anterior end of the body; this divided the body 1:1.2. The spicule was 1.60 mm long, 0.015 mm. wide near the proximal end, and 0.014 mm. - near the distal end; it ended bluntly and was not extruded from the body. The spiny spicule sheath had a length of 2.138 mm. and a proximal width of 0.021 mm. The caudal end was slightly curved and terminated broadly by 3 stout lobes, of which the 2 lateral ones were larger than the single median lobe. The cloaca was subterminal.

Measurements of specimens from two different hosts are compared in Table 16 (page 76).

Other Literature consulted: (20), (21), (64), (91).

TABLE No. 15

Capillaria quisicali Read, 1949: Measurements from two localities

(All measurements in mm.)

	From Common Grackle (Present paper)	From Bronzed Grackle (Type Specimens)
Length of body	9.50	8.5 - 10.3
Maximum Width	0.076	0.084- 0.102
Width Posterior to Vulva	0.065	0.065- 0.070
Distance of Vulva from Anterior end	3.50	2.9 - 4.5

TABLE NO. 16

Capillaria tridens: Comparison of measurements from two different hosts.

(All measurements in mm.)

	From <u>Pipilo erythrophthalmus</u> <u>erythrophthalmus</u> (Present paper)	From <u>Agelaius phoeniceus</u> Type specimens (Read, 1949)
Length	18.5	13.9
Maximum Width	0.069	0.049
Termination Oesophagus from anterior end	8.25	0.2
Spicule length	1.60	1.275
Spicule Width (proximal)	0.015	0.018
(distal)	0.014	-
Spicule Sheath Length	2.138	1.840
Spicule Sheath Width (proximal)	0.021	0.024
(distal)	0.020	-

Superfamily Spiruroidea Railliet and Henry, 1915

Family Tetrameridae Travassos, 1914

The genus Microtetrameres Travassos, 1917

The first report of Microtetrameres from North American birds is that of Cram (20) from the Crow, Corvus americanus. Since then, other species of the genus have been reported from different birds by Schell (81), Boyd (13), Mawson (54) and Ellis (27).

In our material we have found two species of this genus, one in the Common Crow and one in the Common Grackle. The specimens from the grackle could not be identified since no males were found.

Microtetrameres helix Cram, 1927.

14 females of this species were buried in the wall of the proventriculus of a male Common Crow (Corvus brachyrhynchos brachyrhynchos) shot near Norris Lake on the 26th. of July, 1962. The worms were pressed out from the gland ducts of the proventriculus by using curved prongs of a forceps. This is a new locality report.

Females: The coiled worms were 1.15 to 1.58 mm. long and 0.92 to 1.52 mm. wide (average, 1.34 by 1.26 mm.). The body was loosely coiled with about two coils in one direction and one in the reverse direction. The cuticle was very loose and projected from the body in transparent folds. The double-walled and barrel-shaped buccal capsule was 0.023 to 0.026

mm. deep; the muscular oesophagus (pharynx) 0.228 to 0.326 mm. long; and the distance of the nerve ring from the anterior end was 0.123 to 0.152 mm. The anus was 0.152 to 0.180 mm. and the vulva 0.192 to 0.305 mm. from the posterior end, which was finely pointed and protruded from a transparent cuticular collar. The uterine coils occupied all the available space and contained both embryonated and non-embryonated eggs. The tiny bosses (not reported by Cram) at both ends of the embryonated eggs gave them the appearance of being double operculated. In some eggs these bosses were not visible. The size of the fully embryonated eggs was 0.042 to 0.053 mm. by 0.029 to 0.036 mm., the average being 0.046 by 0.032 mm.

Table 17 page 80, compares measurements from two different sources.

Microtetrameres sp.

4 females of an unidentified Microtetrameres sp. were removed from the wall of the proventriculus of a male Common Grackle (Quiscalus quiscula versicolor) killed near Francis Beach of Lake Manitoba on July 30, 1962. No males were recovered.

Females: The worms were red, 1.05 to 0.32 mm. long when coiled and from 0.92 to 1.07 mm. wide. The body was loosely coiled, two coils in one direction were followed by one

in the reverse direction. The buccal capsule was vase-shaped and 0.022 to 0.023 mm. deep. The muscular oesophagus (pharynx) was 0.259 to 0.304 mm. in length; the nerve ring 0.110 mm. from the anterior end. The anus was 0.145 to 0.152 mm. and the vulva 0.220 to 0.267 mm. from the caudal end. The prominent and sheath-like cuticular fold was anterior to the vulva. The tail end tapered gradually into a fine point. The embryonated, thick-walled, barrel-shaped, and bi-operculate eggs were 0.052 to 0.055 mm. long by 0.032 to 0.038 mm. wide, the average being 0.053 by 0.035 mm.

The specimens resembled very closely Microtetrameres spiculata described by Boyd (13) from the Blue-jay, Cyanocitta cristata L. Indeed, it was tempting to identify the present worms with Microtetrameres spiculata but until the males are examined it is safer to refer to the worms from our material as Microtetrameres sp.

Figure 25, (page 87) is a photomicrograph of this worm.

TABLE NO. 17

Microtetrameres helix: Comparison of measurements from two localities.

(All measurements in mm.)

FEMALES	From <u>Corvus brachyrhynchos</u> (Present paper)		From <u>Corvus americanus</u> Type Specimens
	Range	Average	(Gram, 1927)
Length	1.15 -1.58	1.34	1.2 -1.3
Width	0.92 -1.53	1.26	1.0 -1.3
Depth Buccal Capsule	0.023-0.026	0.024	0.23
Nerve Ring	0.123-0.152	0.138	-
Muscular oesophagus (pharynx)	0.228-0.326	0.247	0.225-0.250
Anus	0.152-0.180	0.161	0.141
Vulva	0.192-0.305	0.212	0.216
Eggs	0.042-0.053 x 0.029-0.036	0.046 x 0.032	0.042x0.033

PLATE XI

Fig. 23. Caudal end of Diplotriaena thomasi
from Xanthocephalus xanthocephalus
x 75.

Fig. 24. Caudal end of Diplotriaena sialiae
from Quiscalus quiscula versicolor.
x 75.

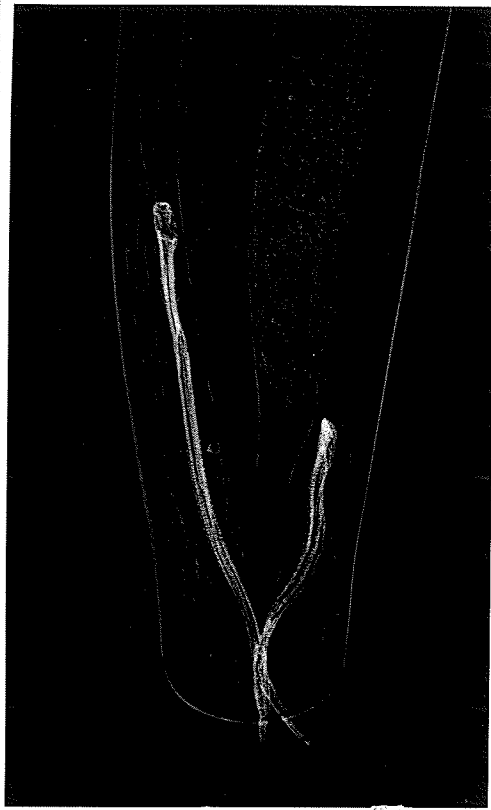


Fig. 23

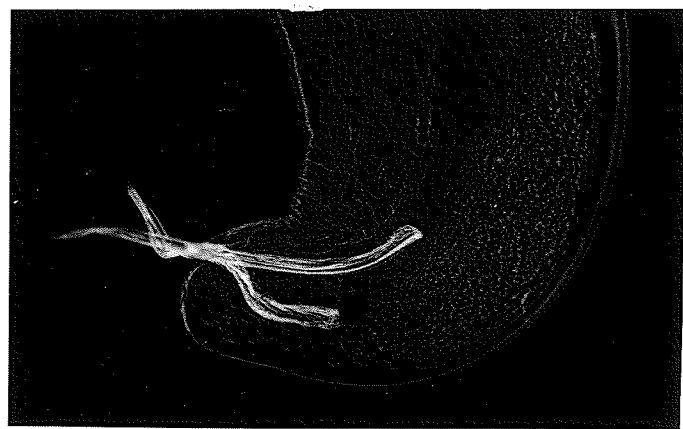


Fig. 24

Family Filariidae Claus, 1885

Subfamily Diplotriaeninae Skrjabin, 1916

The Genus Diplotriaena Railliet and Henry, 1909

Most of the species of this genus have been inadequately described and therefore difficult to differentiate. Seibert (83), however, gave a detailed description of Diplotriaena thomasi which he collected from the body cavity of the White-throated Sparrow (Zonotrichia albicollis). He especially emphasized a warning note to future workers on the intraspecies variations of such structures as the tridents, spicules and caudal papillae, which have been used in species differentiation. Mawson (56) suggested that the types and other materials from this genus needed a re-examination and critical review.

Our material contained two species of the genus Diplotriaena. Descriptions of these species follow:

Diplotriaena thomasi Seibert, 1944

3 specimens (one male and two females) of this species were taken from the body cavity of two female Yellow-headed Blackbirds (Xanthocephalus xanthocephalus) killed in the marshes of Long Lake on July 9, 1962. This is the first report of this nematode from the Yellow-headed Blackbird, and the first report of this nematode from the province of Manitoba.

Males: The length of the body was 50 mm. and the maximum width 0.54 mm.; the body width at the nerve ring was 0.31 mm. The anterior portion of the oesophagus was 0.30 mm. long while the posterior portion was 5.75 mm in length. The nerve ring was 0.24 mm. from the anterior end of the body. The spicules were unequal in length and dissimilar in shape. The longer spicule (1.07 mm. long) was slightly curved at the middle and had transverse striations in the middle part with denticles at the lateral edges. The shorter spicule (0.60 mm. long) was spirally twisted in more than one turn and the transverse striations occurred at the basal third. The subterminal cloaca was located at a distance of 0.091 mm. from the posterior end. The tail ended bluntly and was flanked at the tip by two tiny, marginal, and paired caudal papillae.

Females: The following measurements were taken from one of the two worms. The length of the body was 115 mm. and the maximum width was 0.75 mm. The width at the region of the nerve ring was 0.35 mm. The nerve ring surrounding the anterior oesophagus was 0.24 mm. from the anterior end of the body. The anterior portion of the oesophagus was 0.33 mm. long. The highly salient vulva was located at a distance of 0.65 mm. from anterior end of the body. In the other worm the vulva did not protrude above the lateral edge. The subterminal anus was 0.11 mm. from the rounded caudal end. The uterus did not contain embryonated eggs.

Table 18 (page 86) shows comparison of measurements

from two different hosts and Figure 23 (page 81) the drawing of the tail end of the male.

Diplotrriaena sialiae Mawson, 1957

Two specimens (one female and one incomplete male) of a nematode identified as Diplotrriaena sialiae were recovered from the body cavity of a male Common Grackle (Quiscalus quiscula versicolor) shot near Lockport Lagoon on September 27, 1962. The worms were removed from the mediastinum between the heart and the liver. In the same bird were found a single capillarid nematode and two specimens of the trematode Conspicuum icteridorum.

Mawson (56) described the type specimens of this nematode from a Mountain bluebird (Sialia currucoides) from the province of Alberta. In the present paper a new host and a new locality are recorded for this worm.

Male: The anterior portion of the male was missing and therefore the total length of the worm was not measured. The body width near the posterior end was 0.51 mm. The spicules were unequal in length and dissimilar in shape. The longer spicule was 0.66 mm. long; it was slightly curved in the middle and its basal third transversely striated with distinct denticles on the lateral edges. The shorter spicule (0.44 mm. long) was spirally twisted through about two turns and transversely striated

near the basal end. The cauda was slightly curved.

Females: The length and maximum width of the female were 60 mm. and 0.92 mm. respectively. The length of the paired tridents ranged from 0.175 to 0.185 mm. The 3 arms or prongs of each trident were enlarged at the distal ends and were approximately equal in length. The distance of the nerve ring from the end of the head was 0.320 mm. The oesophagus was divided into two parts with the anterior portion measuring 0.420 mm. The vulva was located at a distance of 0.54 mm. from the anterior end. The uterus looped through the greater part of the body and did not contain eggs. The anus was subterminal and 0.152 mm. from the posterior end.

Figure 24 (page 81) shows the posterior end of the male.

Other Literature consulted: (11), (42), (44), (93), (99).

TABLE NO. 18

Diplotriana thomasi: Comparison of measurements from two different hosts.

(All measurements in mm.)

Females	from <u>Xanthocephalus</u> <u>xanthocephalus</u> (Present paper)		from <u>Zonotrichia</u> <u>albicollis</u> (Seibert, 1944)
	Worm 1	Worm 2	
	Length	105	115
Maximum Width	0.75	0.75	0.56 - 0.94
Width at Nerve Ring	0.35	0.35	-
Nerve Ring	0.30	0.24	0.13 - 0.24
Anterior Oesophagus	0.38	0.33	0.17 - 0.38
Vulva	0.75	0.65	0.30 - 0.86
Eggs	-	-	0.047-0.057 x 0.035-0.039

PLATE XII.

Fig. 25. Microtetrameres sp. from
Quiscalus quiscula versicolor.

x6.

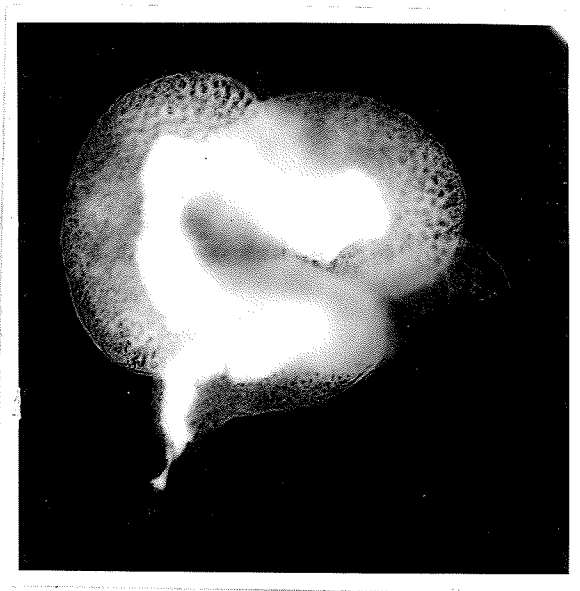


Fig. 25

HELMINTHS FROM MANITOBA CHICKENS.

INTRODUCTION AND METHODS

A survey designed to determine the incidence of helminths in Manitoba chickens as well as to study the intensity of infection with these parasites was carried out in late 1961 and the first half of 1962. The ages of the chickens examined could not be determined since the material for this survey consisted exclusively of guts collected from various eviscerating plants and poultry-dressing stations. 130 guts were examined and 102 (78.5%) found to be infected with one or more species of helminths. Three species of nematodes and three of cestodes were collected and identified. No trematodes and acanthocephalans were found in our material. A summary of helminths collected is given in Table 19 (page 97)

Almost all the worms collected were dead before recovery from the gut. They were preserved in 10% formalin or 70% ethyl alcohol. In assessing the total number of nematodes present in a bird both the mature and immature specimens were counted together. Only whole specimens and the posterior portions of those lending themselves to sex determination were counted.

The area covered during the investigation is mainly south of Winnipeg, with the guts coming from the following centres and towns:

1. Winnipeg and its suburbs.
2. Winkler, Emerson, Homewood.
3. Morden, Carman, Altona, Holmfield.

4. Starbuck, and Fannystelle.
5. Steinbach and Blumenort.

LITERATURE REVIEW

The literature on the helminths of chickens is voluminous. One of the first papers on the fauna of parasites of chickens in Canada is that of Baker (6) who collected endoparasites of poultry in many counties of Quebec Province and reported the presence of 9 species of helminths including Heterakis gallinae and Ascaridia lineata. Adams and Geiser (1) studied helminths of 24 chickens in Dallas County, Texas; and Ferry (28) the cestodes of 50 chickens in Douglas County, Kansas.

Todd (88) studied the helminths of Tennessee chickens and found 17 species - 9 nematode and 8 cestode species. 95 percent of the chickens examined were infected. He concluded that adult birds carried more worms than the young ones and had a wider variety of helminths. In another paper (89) he recorded 5 species of nematodes of the genus Capillaria from chickens in East Tennessee. He reported Capillaria bursata from the United States for the first time. He has also given a key for the identification of the species of this genus parasitizing chickens. In 1947 Todd (90) extended his survey (initiated in 1945) by examining 872 more chickens from poultry markets of Tennessee and found 96.7 percent parasitized. Echinoparypnium recurvatum, an intestinal trematode, and a tapeworm, Fimbriaria

fasciolaris were reported for the first time from chickens in the United States. He found that Heterakis gallinae was the most common nematode, whereas Hymenolepis carioca topped the list of cestodes. He recorded 10 species of nematodes, 9 species of cestodes and only 1 of trematodes.

Read (75) collected 9 species of Capillaria from both domestic and wild birds in Texas and Louisiana, including two new ones and gave keys to the North American species of this genus. Edgar (26) examined 237 chickens from 59 Alabama farms. He found 9 species of cestodes, 13 of nematodes, and 30 of protozoan and arthropod parasites. Reid (76) studied in Georgia, ecto- and endo-parasites of 1,000 broilers of market age. He stated that the high incidence of Ascaridia galli in some forms depended on the methods of broiler production which created optimum conditions for propagation of this nematode.

NEMATODES.

The three species of nematodes collected are listed according to their incidence and intensity of infection. The largest number of nematodes (of various species) found in any one chicken was 2,359, comprising 1,121 specimens of Ascaridia galli, 878 of Heterakis gallinae and 60 of Capillaria columbae.

Heterakis gallinae (Gmelin, 1790)

Heterakis gallinae was the only species of this genus collected. It was the most successful helminth collected, occurring in 68.5% of the chickens examined. A total of 5,793 worms - 3,349 females and 2,444 males - were collected from 89 birds. The average number of worms present in an infected chicken was thus 65.1. The largest number collected from one host was 943 (510 females and 433 males). In this particular bird both caeca were puffed up because of the heavy infection.

The normal habitat of Heterakis gallinae is the caecum, but a few worms were recovered from the rectum and the posterior portion of the small intestine. 15 of the 89 infected birds carried more than 100 worms each, 25 more than 50 worms, and 58 more than 10 worms each.

Ascaridia galli (Schrank, 1788)

This nematode was found in 41 out of 130 birds. A total of 1,784 worms (1,014 females and 770 males) were collec-

ted. The number of worms in the infected birds ranged from 1 to 1,421 but usually did not exceed 5. Only two birds harboured more than 100 worms; one bird contained 1,421 worms (801 females and 620 males). indeed the whole of the intestine - including the duodenum - of this chicken was thickly packed with this nematode, (Figure 26). A group of the worms buried their anterior ends deep into the intestinal mucosa (Figure 27). The average number of worms per infected bird was 43.5.

The normal habitat of Ascaridia galli are the middle and upper portions of the small intestine; only on four occasions have we found it in the duodenum. In the most heavily infected bird (1,421 worms) three specimens were recovered from the left caecum; these might have wandered there accidentally.

Capillaria columbae (Rudolphi, 1819)

Capillaria columbae was the only species of this genus found in the intestine of two birds. In one bird 60 worms (49 females and 11 males) were found in the intestine, some of them in the duodenum. The great majority of the worms was collected from the upper part of the small intestine. In the other bird two specimens, one female and one male, were found in the duodenum. The total number of worms collected from both birds was 62. The ratio of the number of females to that of the males was approximately 4:1.

Ten females ranged in length from 9.9 mm. to 15.6 mm. (an average of 13.1 mm.) and a maximum width of 0.076 to 0.088 mm. The eggs measured from 0.044 to 0.055 mm by 0.022 to 0.028 mm. The lengths of five males ranged from 7.5 to 10.7 mm. with spicular lengths from 0.92 to 1.12 mm..

PLATE XIII.

Fig. 26. Ascaridia galli. Heavy infection
in small intestine of chicken.

Fig. 27. Ascaridia galli. Anterior portion
buried in intestinal wall.

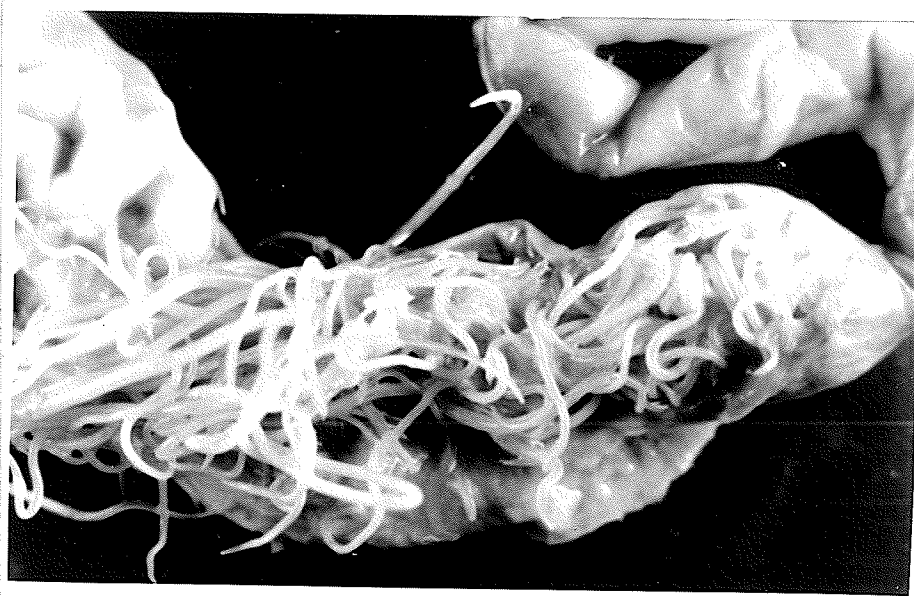


Fig. 26

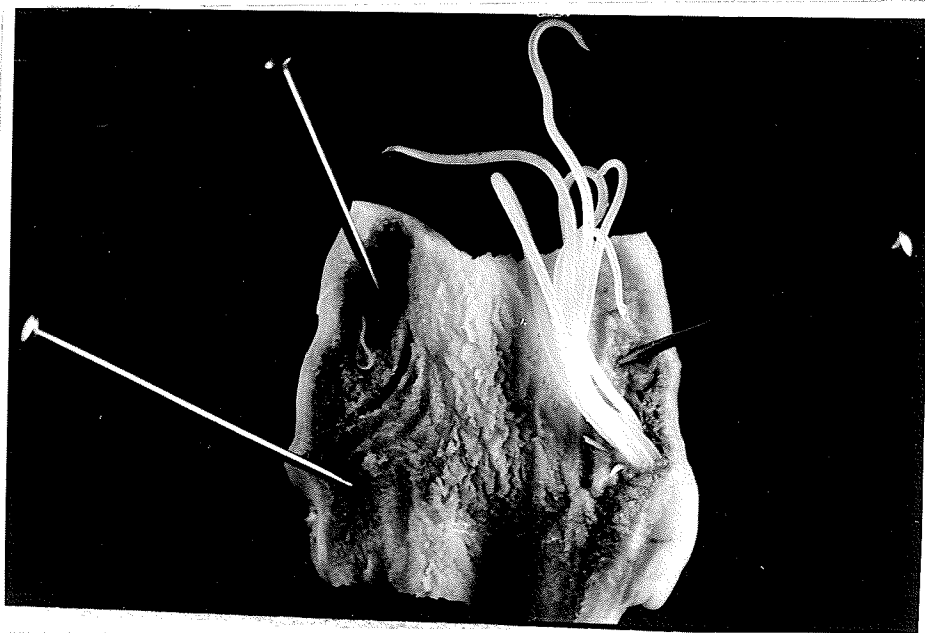


Fig. 27

CESTODES

Only 3 species of cestodes were found, and only eight birds (6.1%) were infected. Under the present conditions of poultry breeding in Manitoba, the cestodes are not as successful as the nematodes. The number of cestodes recorded from infected birds varied from 2 to 48.

Raillietina cesticillus (Molin, 1858)

This species was found in 5 birds and was the most common cestode. Three worms were found in each of three infected birds; two in one bird and seven in the other. The maximum length was 100 mm., the minimum 16 mm., and the average for eight worms 53 mm. The worms collected in the spring and early summer were shorter (average length of 4 was 21.5 mm.) than those collected in the fall (average length being 84.5 mm.). This agrees with the figures given by Hall in 1945.

Raillietina echinobothrida (Megnin, 1881)

85 specimens of this species were recovered from the small intestine of two birds. The incidence was thus 1.54%. All specimens were thin and long. Not all the specimens could be measured since many of them have been found to be torn.

Choanotaenia infundibulum (Bloch, 1779)

Nine specimens of this cestode were found from the anterior portion of the small intestine of a single bird. One whole worm measured 43 mm. in length and 1.5 mm. maximum width, the other 37 mm. by 1.5 mm.

Table No. 19

Helminths collected from 130 Manitoba chickens.

Species	Number Chickens Infected	Percent Incidence	Total Worms Collected	Range of Specimens Present	Average Number of Worms per Host
<u>Heterakis gallinae</u>	89	68.5	5,793	1-943	65.1
<u>Ascaridia galli</u>	41	31.5	1,784	1-1,421	43.5
<u>Capillaria columbae</u>	2	1.54	62	2-60	31.0
<u>Raillietina cesticillus</u>	5	3.85	18	2-7	3.6
<u>Raillietina echinobothrida</u>	2	1.54	85	34-48	42.5
<u>Choanotaenia infundibulum</u>	1	0.8	9	-	9.0

SUMMARY AND CONCLUSIONS

SUMMARY:

1. 85 birds belonging to 26 species were examined; 49 of them harboured one or more species of helminths. 20 species of parasites were found - 9 trematodes, 5 cestodes, and 6 nematodes. No new species of helminths were described. A number of new locality and host records have been reported.

2. A chapter is included on helminths from chickens in Manitoba. 130 chickens were examined; of these 102 were found to be infected with one or more species of helminths. Three species of nematodes and three of cestodes were collected and identified. No trematodes and acanthocephalans were found.

CONCLUSIONS:

Owing to the short duration of the survey - May to October 1962 - and the small numbers of each species of birds examined, no definite conclusions could be made as to the distribution and host specificity of the parasites. The author wishes to state, however, that most of the parasites of passerine birds reported in the United States have been found during this survey. Leucochloridium melospizae, Hymenolepis corvi, and Liga brasiliensis appear to be, to some extent, host specific.

The sanitary conditions under which poultry is kept in

this province probably account for the small number of parasitic species reported. The high incidence of Heterakis gallinae and Ascaridia galli in the birds depends on the methods of broiler production which favour the dissemination of nematodes developing without intermediate hosts.

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