

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

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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.