

banded in any previous corresponding period. During the fall and winter of 1939-40, 498 were banded. During a similar period of 1937-38, fifty-four birds were banded to March 1, and during 1938-39, forty-three birds were banded. Therefore, the unusual number of Purple Finches coming through in the fall and winter migration of 1939-40, suggests the possibility of another invasion in the spring of 1940, or, perhaps, some type of "lag" factor never before recognized in our studies on migratory birds.

Ardmore, Pennsylvania.

SOME PARASITES OF THE EASTERN CROW

(*Corvus brachyrhynchos brachyrhynchos* Brehm)¹

By B. B. MORGAN and E. F. WALLER

DURING the past two academic years, 1938-39 and 1939-40, we have had the opportunity to examine a total of 112 crows (*Corvus brachyrhynchos brachyrhynchos* Brehm); 64 females and 48 males. Seventeen of these were collected in southern Wisconsin and the remainder from five different counties in Iowa. With the exception of six live birds in the Wisconsin group, all others had been shot and had been dead from 24 to 72 hours by the time the examination was made. The dead crows were usually submitted in groups of twelve to fifteen at a time, all in a single container. This naturally provided an opportunity for an exchange of the ectoparasites. The parasitic fauna of these 112 crows was so heavy and the parasites so widely distributed taxonomically that the survey seems worthy of record.

MATERIALS AND METHODS

Part of these birds were submitted by State Conservation Officers through the U. S. Biological Survey, Iowa Cooperative Unit, Iowa State College, Ames, Iowa. Other crows were submitted by hunters and sportsmen. Many of the birds were shot for bounty.

Methods of procedure were very similar to that outlined by Morgan and Waller (1940). That is, the carcasses were chilled at 40° C. for at least one hour. This benumbed the ectoparasites so they could be readily collected. The lice and mites were preserved in 95 per cent alcohol. Examination of the carcasses was made under a 500 watt daylight lamp. After the ectoparasites had been collected, the skin was incised from the head to the anus along the ventral median line and then laid back on each side. This facilitated

¹A joint contribution from the University of Wisconsin, Department of Zoology and Veterinary Science and Iowa State College, Department of Veterinary Pathology; Project 570 in cooperation with the United States Biological Survey, American Wildlife Institute, and the Iowa Conservation Commission.

the examination of the subcutis and the skeletal musculature. The carcass was then opened and all viscera removed. The esophagus, crop, proventriculus, gizzard, and intestines were examined separately in the order named. The contents of each of these organs were placed in shallow, white enamel, 12" x 18" pans and running water was used to separate the ingesta and mucus from the parasites. The nematodes and cestodes were collected in a physiological saline solution to which had been added 10 per cent commercial formalin or in 70 per cent alcohol. A composite sample of the rectal contents of each group of birds was examined for parasitic ova and coccidia. In making this examination, the modification of the routine sugar flotation method as described by Waller (1939) was used. The parasites found are hereinafter recorded. Table I shows the number of crows parasitized and the per cent incidence of each parasite.

TABLE I
NUMBER OF CROWS PARASITIZED AND THE PER CENT INCIDENT OF
EACH SPECIES OF PARASITE FOUND IN THIS SURVEY

Name of Parasite	Common Name	Location	Number	
			Birds Parasitized	Per Cent Incident
<i>Haemoproteus danilewskii</i>	Bird Malaria	Red Cell	1	.89
<i>Plasmodium relictum</i>	Bird Malaria	Red Cell	1	.89
<i>Leucocytozoon sakharoffi</i>	Bird Malaria	Blood Cell	3	2.7
<i>Trypanosoma avium</i>	Trypanosome	Blood	1	.89
<i>Isospora sp.</i>	Coccidia	Feces	2	1.8
<i>Hymenolepis corvi</i>	Tapeworm	Intestine	44	39.3
<i>H. variable</i>	Tapeworm	Intestine	1	.89
<i>Capillaria contorta</i>	Capillaria	Crop	2	1.8
<i>Acuaria anthuris</i>	Gizzard Worm	Gizzard	19	16.9
<i>Microtetrameres helix</i>	Stomach Worm	Proventriculus	43	38.3
<i>Diplotrriaena tricuspis</i>	Filaria	Body Cavity	6	5.3
<i>Microfilaria</i>	Blood Worm	Blood	1	.89
<i>Collyricium faba</i>	Fluke	Skin near anus	7	6.2
<i>Acarina</i>	Mite	Feathers	7	6.2
<i>Philopterus corvi</i>	Biting Louse	Skin-Feathers	26	23.2
<i>Degeeriella secundaria</i>				
<i>D. rotundata</i>				
<i>Myrsidea interruptata</i>				

ECTOPARASITES

MALLOPHAGA

Family: PHILOPTERIDAE (Burmeister, 1838)

Genus: PHILOPTERUS (Nitzsch, 1818)

Philopterus corvi (Linnaeus, 1758)

Of the 46 biting lice collected from 112 crows, 20 of them were *Philopterus corvi* (*Docophorus corvi*, Osborn, 1896). This parasite was collected from the breast feathers.

Genus: DEGEERIELLA (Neumann, 1906)

Degeeriella rotundata (Osborn, 1896)

Fourteen of the specimens collected were *Degeeriella rotundata* (*Nirmus ro-*

tundatus Osborn, 1896). The majority of this species was taken from the flight feathers.

***Degeeriella secundaria* (Osborn, 1896)**

Nine specimens of this species were collected from the flight feathers; *Degeeriella secundaria* (*Nirmus secundarius* Osborn, 1896).

Family: MENOPONIDAE (Mojoberg, 1910)

Genus: MYRSIDEA (Waterston, 1910)

***Myrsidea interruptata* (Osborn, 1896)**

Only three specimens of this parasite, *Myrsidea interruptata* (*Menopon interruptus* Osborn, 1896), were found on the breast feathers.

ACARINA

Family: ANALGESIDEA (Nitzsch)

Several small mites were found at the base of the breast feathers of seven crows. They belong to the family Analgesidea and subfamily Pterolichinae, but species determination has not as yet been made.

TREMATODA

Family: COLLYRICLIDAE (Ward, 1917)

Genus: COLLYRICLUM (Kossack, 1911)

***Collyriclum faba* (Kossack, 1911)**

As a rule trematodes are internal parasites, but this monostome fluke has the strange characteristic of forming cysts in the skin of the ventral surface around the anus of various birds. Seven crows from Iowa were infected with the immature form of this parasite. There have been many reports of *C. faba* from various hosts. Beaudette (1940) reported *C. faba* from crows in Michigan, and Riley, according to Beaudette (1940), stated he found the same parasite in Minnesota crows.

ENDOPARASITES

PROTOZOA

Order: COCCIDIA (Leuckart, 1879)

Genus: ISOSPORA (Schneider, 1875)

***Isospora* species**

Fecal examination by the modified sugar flotation method revealed coccidia in two crows from southern Wisconsin. Sporulation proved these forms to be *Isospora*. Species determination was not attempted. In a search of the literature the only reference to *Isospora* in crows was made by Boughton (1929, 1938) from crows in Minnesota and New Jersey.

Order: HAEMOSPORIDIA (Danilewsky, 1885)

Genus: HAEMOPROTEUS (Kruse, 1890)

***Haemoproteus danilewskii* (Kruse, 1890)**

A heavy infestation of this parasite was found in one crow from southern Wisconsin. The descriptions fall into the range given by Coatney and West (1938). The entire red blood cell is filled by the parasite. Herman (1938) in the examination of four crows from Cape Cod found two infected with *Haemoproteus* and two negative. Coatney and Jellison (1940) reported *H. danilewskii* from a crow in Montana.

Genus: PLASMODIUM (Marchiafava and Celli, 1885)

***Plasmodium relictum* (Huff, 1937)**

One crow from southern Wisconsin carried a light infestation of this parasite. Coatney and West (1938) found *P. relictum* from a crow in Nebraska.

Genus: LEUCOCYTOZOOM (Danilewsky, 1890)
Leucocytozoon sakharoffi (Sambon, 1908)

Three crows from southern Wisconsin were found infected with *L. sakharoffi*. Coatney and West (1938) found this parasite in an immature crow from Nebraska. There is some doubt as to whether our form may be *L. berestneffi* (Sambon, 1908) reported by Coatney and Roudabush (1937) from the magpie (*Pica pica hudsonia*). Coatney and Jellison (1940) listed *L. berestneffi* from a crow in Montana.

Order: PROTOMONADINA (Blochmann)
Genus: TRYPANOSOMA (Gruby, 1843)
Trypanosoma avium (Danilewsky, 1885)

The name *Trypanosoma avium* is a collective term for all Trypanosomes found in birds. Until species differentiation can be worked out, this name must be utilized. One crow from southern Wisconsin harbored this parasite. This crow also had a light infestation of *Plasmodium*. Only two specimens of *T. avium* were found. These specimens contained myonemes, and were 46 and 51 μ in length, respectively. The flagellum is rather short with a wide undulating membrane. Coatney and West (1938) reported *T. avium* from a crow in Nebraska, which is quite similar to our form.

CESTODA

Family: HYMENOLEPIDIDAE (Ariola, 1899)
Genus: HYMENOLEPIS (Weinland, 1858)

Hymenolepis (Weinlandia) corvi (Mayhew, 1925)

This tapeworm was found in the anterior portion of the small intestine of 44 crows. It was by far the most common tapeworm found in this survey. Mayhew (1925) first reported *H. corvi* in the crow from Illinois. The location of the three testes, the hooks on the scolex, and the structure of the ovaries assures us that this material is *H. corvi*. The mature specimens varied in length from 40 to 75 mm. The infestation varied from 1 to 15 worms. Williams (1929) found this tapeworm in Nebraska crows.

Hymenolepis (Wardium) variabile (Mayhew, 1925)

A single specimen was removed from the posterior portion of the small intestine of a crow shot in southern Wisconsin. No other tapeworms were present. The parasite measured 24 mm. in length. The scolex is large, with a small rostellum armed with a single row of hooks. The three testes vary in position, but the majority were two posterior and one anterior near the median line. Mayhew (1925) first reported this parasite from a crow taken in Illinois.

Ransom (1909) and Williams (1929) both reported the finding of a tapeworm (*Anomotaenia constricta* Molin, 1858) from Nebraska crows. This parasite was not encountered in this survey. Ward (1901) recorded a table showing various parasites collected from Nebraska birds. The table showed the examination of one crow which harbored tapeworms but species identification was not given. Later, Ward and Whipple (1918) stated that Ransom's identification of the parasite was *A. constricta*.

NEMATODA

Family: TRICHURIDAE (Railliet, 1915)
Genus: CAPILLARIA (Zeder, 1800)
Capillaria contorta (Creplin, 1839)

Two crows were infested with this parasite. For species determination eight female and one male specimens were studied. The characteristics of this parasite agree in all respects to the description given by Cram (1936). The spicule sheath carried recurved spines and a single spicule. Canavan (1931) reported *C. contorta* from the crow, constituting a new host for this parasite. This crow had been in the Philadelphia Zoological Garden for eight months.

Family: ACUARIIDAE (Seurat, 1913)

Genus: ACUARIA (Bremser, 1811)

Acuaria anthuris (Rudolphi, 1819)

This gizzard worm was found in 19 crows. Cram (1927) pointed out the complexity of the type species, *A. anthuris*, due to poor description by early workers. However, the descriptions by Cram (1927) summarized the work of Rudolphi, Schneider, v. Linstow, and Mueller. Williams (1929) found a gizzard worm in the crow from Nebraska and subsequently named it a new species, *A. nebraskensis*. Cram (1934) clarified the matter with descriptions from other authors since 1927. She also pointed out that *A. nebraskensis* was a synonym for *A. anthuris*. Beaudette and Hudson (1936) stated that *A. anthuris* was a common parasite of the crow in New Jersey. In the species identification of our material, 17 female and 11 male specimens were studied.

Family: TETRAMERIDAE (Travassos, 1914)

Genus: MICROTETRAMERES (Travassos, 1915)

Microtetrameres helix (Cram, 1927)

This small nematode was found in the proventriculus of 43 crows. Two male and 30 female specimens were studied. Cram's (1927) descriptions were based on specimens from crows obtained in Washington, D. C. This parasite is unique in that sexual dimorphism occurs in the females. This parasite has also been reported from Canada. Gates (1933) reported the finding of *Tetrameres americana* (Cram, 1927) in a crow from New York, but Cram (1936) was dubious of the species determination.

Family: FILARIIDAE (Cobbold, 1864)

Genus: DIPLOTRIAENA (Railliet and Henry, 1909)

Diplotriaena tricuspis (Fedtschenko, 1874)

This rare filariid nematode was found on six occasions from 112 crows. This parasite was usually found in the abdominal cavity. Morgan and Waller (1940) reported this parasite for the first time in North America from a crow and recorded a complete description of the form. Cram, in a personal communication to Beaudette and Hudson (1936), stated that *Diplotriaena tricuspis* was the only filariid worm in crows in this country. Her statements are probably based on records of the Zoölogical Division, U. S. D. A., as the writers have been unable to find mention of this parasite prior to our own report.

MICROFILARIA (Cobbold, 1880)

Microfilaria were found in the blood stream of two crows from southern Wisconsin. There have been other reports of microfilaria in crows both in Europe and North America. Elliot (1903), Beaudette and Hudson (1936), and Boughton et al. (1938) have reported microfilaria from crows in North America. The specimens found in our material averaged 130μ in length and 5μ in width. The anterior end is quite blunt and a sheath was evident. Whether this microfilaria is associated with the adult *D. tricuspis* has not as yet been determined.

Other nematodes reported in North American crows but not found in this survey include *Porrocaecum ensicaudatum* (Zeder, 1800) reported by Canavan (1931) from the stomach, duodenum, and gizzard of crows in the Philadelphia Zoölogical Garden; *Syngamus gracilis* (Chapin, 1925) was reported by Chapin (1925) from the trachea of crows in the Philadelphia Zoölogical Park. There is some discussion whether *S. gracilis* is a synonym of *S. trachea*.

In addition to the aforementioned parasites one crow was found to be affected with tuberculosis and another with visceral gout, both birds being markedly emaciated.

Without wishing to enter into the controversy as to whether the

crow should be protected or eradicated, we would like to record our brief observations on the gizzard contents of these birds. The only animal matter observed consisted of small bones and skins of what appeared to be mice, and also some rabbit fur and flesh. We did not find feathers in a single one of the 112 gizzards. Approximately 90 per cent of the gizzards contained corn. In comparing these observations with those of other investigators it must be kept in mind that these birds were collected between December 1, and the end of the following March.

SUMMARY

1. One hundred and twelve crows (*Corvus brachyrhynchos brachyrhynchos* Brehm) from southern Wisconsin and Iowa were examined for parasites and disease.
2. Ninety-one or 81.2 per cent of the crows were found to be parasitized.
3. Four species of Mallophaga; *Philoaterus corvi*, *Degeeriella rotundata*, *D. secundaria*, *Myrsidea interruptata* and one species of Acarina; belonging to the family *Anagesidea*, were noted.
4. Five species of Protozoa; *Trypanosoma avium*, *Leucocytozoon sakharoffi*, *Plasmodium relictum*, *Haemoproteus danilewskii*, and *Isospora* species were identified.
5. The immature form of *Collyriclum faba* was encountered in seven crows.
6. Two species of Cestodes; *Hymenolepis (Weinlandia) corvi* and *H. (Wardium) variabile*, were found.
7. Four species of Nematodes; *Capillaria contorta*, *Acuaria anthuris*, *Microtetrameres helix*, *Diplotrriaena tricuspis* were recorded and a microfilaria was found in the blood stream.

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