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Research Note

Helminths of American Robins, *Turdus migratorius*, and House Sparrows, *Passer domesticus* (Order: Passeriformes), from Suburban Chicago, Illinois, U.S.A.

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ABSTRACT: Thirty American robins (*Turdus migratorius*, Turdidae) and 10 house sparrows (*Passer domesticus*, Passeridae) were collected in June and July 2010 and 2011 from SW suburban Chicago, Illinois, and examined for helminths. In total, 9 helminth species (1 digenetic trematode: *Lutztrema monenteron*; 2 cestodes: *Choanotaenia* sp. and *Paricterotaenia* sp.; 5 nematodes: *Chandlerella quiscali*, *Porrocaecum ensicaudatum*, *Splendidofilaria* sp., *Syngamus trachea*, and *Synhimantus nasuta*; and 1 acanthocephalan: *Plagiorhynchus cylindraceus*) occurred in 30 American robins. Both *Choanotaenia* sp. and *P. cylindraceus* had the highest prevalence (40%). *Lutztrema monenteron* had the highest mean intensity (37), followed by *Syngamus trachea* (8.7), which also had the highest mean abundance (3.2). Juvenile American robins were parasitized by 7 of the 9 species, indicating that the majority of parasites found have a focus of infection in the suburban environment. Three helminth species (1 trematode: *Urogonimus* sp.; 1 cestode: *Paricterotaenia* sp.; and 1 nematode: *Splendidofilaria* sp.) occurred in 10 house sparrows. *Urogonimus* sp. and *Paricterotaenia* sp. each had a prevalence of 20%. *Urogonimus* sp. had the highest mean intensity (18.5) and mean abundance (3.7) in house sparrows. Gravid individuals of all helminth species were found. The survey reported herein is consistent with previous helminthological studies conducted on the helminths of American robins and house sparrows, except for the occurrence of *Paricterotaenia* sp. and *Chandlerella quiscali* in robins.

KEY WORDS: Trematoda, Cestoda, Nematoda, Acanthocephala, *Turdus migratorius*, American robin, *Passer domesticus*, house sparrows, Chicago, Illinois.

The helminths of the American robin (*Turdus migratorius* Linnaeus, 1758) have been studied in Illinois and the surrounding states by Lincicome (1939), Van Cleave (1942), Read (1950), Denton and Byrd (1951), Levin (1961), Robinson (1961), Villella (1961), Baker and Hamon (1968), and Cooper and Crites (1974a). On the basis of their study site

descriptions, most birds examined were collected from rural environments. The helminths of house sparrows (*Passer domesticus* Linnaeus, 1758) have been studied in Illinois and the surrounding states by Hopkins and Wheaton (1935), Kintner (1938), Huizinga et al. (1971), Koch and Huizinga (1971), and Cooper and Crites (1974b).

Since helminthological studies on American robins and house sparrows from urban environments are infrequent, and the last surveys on their helminths from North America were performed over 25 yr ago (Cooper and Crites, 1974b, 1976a), we believed the examination of American robins and house sparrows in Illinois would provide more information on the helminth faunas of these bird species. The objectives of the present study were: (1) to document helminths of American robins and house sparrows collected in residential neighborhoods and urban green spaces (e.g., cemeteries and parks) in suburban Chicago, Illinois; and (2) to characterize the helminths found in juvenile and adult American robins to identify helminths with local transmission cycles (i.e., local focus of infection), since the American robin is a migratory species.

Thirty American robins and 10 house sparrows were collected in June and July 2010 and 2011 from SW suburban Chicago, Illinois. Collection sites included residential and seminatural sites in the municipalities of Alsip, Evergreen Park, Oak Lawn, and Palos Hills (Loss et al., 2009). Birds were captured during the day and roosting birds were captured at night with mist nets (Hamer et al., 2008), an extension net, and by hand using a flashlight to disorient (Hamer et al., 2013). Birds were euthanized by cervical dislocation and separated into juveniles (i.e., fledglings that had left the nest and were <4 mo old) and adults (>9 mo old) according to plumage, iris color, and palate (Pyle, 1997). Birds were stored at 4°C and necropsied within 12 hr. The brain, heart, trachea, esophagus, crop, lungs, liver, intestine, and

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Table 1. Overall prevalence (P), mean intensity (MI) \pm standard error (SE) (maximum), and mean abundance (MA) \pm SE of helminths in 30 *Turdus migratorius*, and infection values of 19 juvenile and 11 adult *T. migratorius* collected in suburban Chicago, Illinois in 2010 and 2011.

Helminth	Overall			Juveniles			Adults		
	P (%)	MI \pm SE (maximum)	MA \pm SE	P (%)	MI	MA	P (%)	MI	MA
Trematoda									
<i>Lutztrema monenteron</i>	7	37.0 \pm 19.0 (56)	2.5 \pm 1.9	0	0	0	18	37	6.7
Cestoda									
<i>Choanotaenia</i> sp.	40	5.0 \pm 1.4 (17)	2.0 \pm 0.7	47	6.3	3	27	1	0.3
<i>Paricterotaenia</i> sp.	17	2.0 \pm 0.7 (5)	0.3 \pm 0.2	11	1	0.1	27	2.7	0.7
Nematoda									
<i>Chandlerella quisquali</i>	3	4	0.1 \pm 0.1	5	4	0.2	0	0	0
<i>Porrocaecum ensicaudatum</i>	33	3.9 \pm 1.2 (10)	1.3 \pm 0.5	37	4	1.5	27	3.7	1
<i>Splendidofilaria</i> sp.	7	4.5 \pm 0.5 (5)	0.3 \pm 0.2	0	0	0	18	4.5	0.8
<i>Syngamus trachea</i>	37	8.7 \pm 1.2 (16)	3.2 \pm 0.9	58	8.7	5.1	0	0	0
<i>Synhimantus nasuta</i>	3	12	0.4 \pm 0.4	5	12	0.6	0	0	0
Acanthocephala									
<i>Plagiorhynchus cylindraceus</i>	40	6.3 \pm 1.4 (15)	2.5 \pm 0.8	37	7.3	2.7	46	4.8	2.2

body cavity were examined for helminths. Trematodes, cestodes, and acanthocephalans were stored in 70% alcohol, hydrated, stained with Grenachers borax carmine, dehydrated in alcohol, and mounted in Canada balsam. Nematodes were stored in 70% alcohol and cleared in glycerine. Use of prevalence (percentage of animals infected with a helminth species in a sample), mean intensity (mean number of helminths of a species per infected animal), and mean abundance (mean number of helminths of a species per examined animal) follows Bush et al. (1997). Statistical analyses were performed in Program R (R Development Core Team, 2011).

Voucher specimens were deposited in the United States National Parasite Collection, Beltsville, Maryland, as follows: *Lutztrema monenteron* (Price and McIntosh, 1935) (Trematoda: Dicrocoeliidae) (105928); *Urogonimus* sp. Monticelli, 1888 (Trematoda: Leucochloridiidae) (105929); *Choanotaenia* sp. (Lincicome, 1939) (Cestoda: Dilepididae) (105930); *Paricterotaenia* sp. (Linton, 1927) (Cestoda: Dilepididae) (105931); *Chandlerella quisquali* (von Linstow, 1904) (Nematoda: Onchocercidae) (105668); *Porrocaecum ensicaudatum* (Zeder, 1800) (Nematoda: Anisakidae) (105932); *Splendidofilaria* sp. Skrjabin 1923 (Nematoda: Onchocercidae) (105669); *Syngamus trachea* (Montagu, 1811) (Nematoda: Syngamidae) (105933); *Synhimantus nasuta* (Zhang, Brooks, and Causey, 2004) (Nematoda: Acuariidae) (105934); and *Plagiorhynchus cylindraceus* (Goeze, 1782) (Acanthocephala: Plagiorhynchidae) (105935).

Eighty percent of all American robins sampled were infected with at least 1 helminth species. Nine helminth species (1 digenetic trematode: *L. monenteron*; 2 cestodes: *Choanotaenia* sp. and *Paricterotaenia* sp.; 5 nematodes: *Chandlerella quisquali*, *Porrocaecum ensicaudatum*, *Splendidofilaria* sp., *Syngamus trachea*, and *Synhimantus nasuta*; and 1 acanthocephalan, *Plagiorhynchus cylindraceus*) occurred in 30 American robins (Table 1). Helminth species with the highest prevalences included *Choanotaenia* sp. (40%), *P. cylindraceus* (40%), *Syngamus trachea* (37%), and *Porrocaecum ensicaudatum* (33%). *Lutztrema monenteron* had the highest mean intensity (37), followed by *S. trachea* (8.7). *Syngamus trachea* had the highest mean abundance (3.2), followed by *L. monenteron* (2.5) and *Plagiorhynchus cylindraceus* (2.5). All helminth species infecting American robins occurred in the intestine except for *C. quisquali* (brain), *Splendidofilaria* sp. (heart), *Syngamus trachea* (trachea), and *Synhimantus nasuta* (esophagus).

Helminths found in juvenile and adult American robins are presented in Table 1. Ninety percent of the juvenile birds examined were infected with at least 1 helminth species, whereas 73% of the adults were infected. *Syngamus trachea* had a prevalence of 58%, *Choanotaenia* sp. had a prevalence of 47%, and *Porrocaecum ensicaudatum* and *Plagiorhynchus cylindraceus* each had a prevalence of 37% in juveniles. *Syngamus trachea* had the highest mean intensity (8.7) and mean abundance (5.1). In adult

Table 2. Prevalence (P), mean intensity (MI) \pm standard error (SE) (maximum), and mean abundance (MA) \pm SE of helminths of 10 *Passer domesticus* collected in SW suburban Chicago, Illinois in 2010 and 2011.

Helminth	P	MI \pm SE (maximum)	MA \pm SE
Trematoda			
<i>Urogenimus</i> sp.	20%	18.5 \pm 5.5 (24)	3.7 \pm 2.6
Cestoda			
<i>Paricterotaenia</i> sp.	20%	6.5 \pm 3.5 (10)	1.3 \pm 1.0
Nematoda			
<i>Splendidofilaria</i> sp.	10%	3	0.3 \pm 0.3

American robins, *P. cylindraceus* had a prevalence of 46%, and *Choanotaenia* sp., *Paricterotaenia* sp., and *Porrocaecum ensicaudatum* each had a prevalence of 27%. Although only 2 adult American robins were infected, *L. monenteron* had the highest mean intensity (37) and mean abundance (6.7). Juvenile American robins were not infected with *L. monenteron* and *Splendidofilaria* sp., whereas adults were not infected with *C. quiscalis*, *Syngamus trachea*, or *Synhimantus nasuta*. There were no significant differences in the proportions of uninfected and infected juveniles and adults (chi-square analyses, $P > 0.05$), and in intensities and abundances (Mann-Whitney *U*-test) for those helminth species that infected both juvenile and adult American robins.

Fifty percent of all house sparrows examined were infected with at least 1 helminth species. Three helminth species (1 digenetic trematode: *Urogenimus* sp.; 1 cestode: *Paricterotaenia* sp.; and 1 nematode: *Splendidofilaria* sp.) were found in those infected (Table 2). Each helminth species had a prevalence of 20% or less. *Urogenimus* sp. had the highest mean intensity (18.5) and mean abundance (3.7). Of the juvenile house sparrows examined, 33% were parasitized by at least 1 helminth species, and 57% of the adults were parasitized. *Urogenimus* sp. and *Paricterotaenia* sp. were found in the intestine and *Splendidofilaria* sp. infected the heart.

Some brief comments should be made on the condition of the helminths found in American robins, house sparrows, and on host-parasite relationships. Whole mounts of trematodes involved unflattened specimens. Several individuals of *Urogenimus* sp. were attached together by the oral sucker, incorporating a portion of another individual. Individuals of *Choanotaenia* sp. and *Paricterotaenia* sp. were difficult to identify because some were in poor

condition. Furthermore, scoleces were separated from strobilas in some individuals, and in others only a scolex was found.

Wheelwright (1986) reported that American robins have diets that are diverse within local regions of the United States, and that the major food classes, consumed in every combination, were soft- and hard-bodied invertebrates and fruits. Gavett and Wakely (1986) reported that grains, bird seed, and insects (primarily coleopterans) were all important food items for urban house sparrows. *Lutztrema monenteron* uses terrestrial snails as first intermediate hosts (Villella, 1961), and all dicrocoelid life cycles thus far determined have implicated an arthropod second intermediate host. American robins become infected with *L. monenteron* by eating infected arthropods. House sparrows probably become infected with *Urogenimus* sp. by eating infected snails (Lewis, 1974). Stuart and Alloway (1988) found ants of the genus *Leptothorax* infected with *Choanotaenia* cysticercoids in Illinois, Ohio, Michigan, and Quebec, whereas Horsfall and Jones (1937) reported that the housefly and several species of beetles and grasshoppers have been reported as intermediate hosts for *Choanotaenia*. *Paricterotaenia* use earthworms as intermediate hosts to complete their life cycles (Edwards and Bohlen, 1977). Levin (1961), Cooper and Crites (1976b), and McNeil and Anderson (1990) demonstrated that a variety of terrestrial oligochaetes serve as intermediate hosts for *Porrocaecum ensicaudatum* and *Syngamus trachea*. *Synhimantus nasuta* and *Plagiorhynchus cylindraceus* use terrestrial isopods as intermediate hosts (Cram, 1931; Schmidt and Olsen, 1964; Cooper and Crites, 1976b). *Chandlerella quiscalis* and *Splendidofilaria* sp. are transmitted by an arthropod vector, most likely *Culicoides* midges (Robinson, 1971; Huizinga and Granath, 1984; Bartlett, 2008), and are the 2 most abundant species of filarioid nematodes infecting American robins and house sparrows in suburban Chicago, Illinois on the basis of molecular analysis (Hamer et al., 2013).

Lutztrema monenteron, *Choanotaenia* sp., *Chandlerella quiscalis*, *Porrocaecum ensicaudatum*, *Syngamus trachea*, *Synhimantus nasuta*, and *Plagiorhynchus cylindraceus* were not found in house sparrows, whereas *Urogenimus* sp. was not found in American robins. It is difficult to compare the helminth species found in these 2 avian species because of the difference in the number of each bird species examined. However, we document fewer helminths in house sparrows, which is corroborated

by previous reports (Cooper and Crites, 1974b) and which is expected given that American robins consume more arthropods than do house sparrows (Gavett and Wakeley, 1986). During the American robin breeding season in Chicago from April to June, arthropods make up almost 100% of the diet (Wheelwright, 1986), which would explain the high exposure to helminths in juvenile American robins. The presence of 7 helminth species in juvenile American robins, which primarily relates to the avian diet, indicates a local focus of infection. All helminth species infecting house sparrows were locally acquired since it is a bird species that does not migrate.

Helminth species infecting American robins in the present study have been reported from this bird species in other studies (Cooper and Crites, 1974a), except for *Paricterotaenia* sp. and *C. quisquali*. To our knowledge, the American robin is a new host record for these 2 helminth species. The helminth fauna of American robins from urban environments is similar to those of birds from rural environments. *Paricterotaenia* sp., *Splendofilaria* sp., and a species of *Urogonimus* have been reported from house sparrows (Cooper and Crites, 1974b; Locke et al., 2012). This study increases the knowledge of helminths infecting American robins and house sparrows, and implicates helminth species maintaining an urban transmission cycle.

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