

A Survey of Helminth Parasites in the Salamanders and Certain Anurans from Wisconsin

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ABSTRACT: During 1979 and 1981, 117 salamanders and 18 anurans representing 14 host species were collected from seven localities in Wisconsin and examined for helminth parasites. Forty-two percent of salamanders and 89% of anurans were infected with one or more species of parasite. Four nematode species, seven digenean species, one species of cestode, and one monogenean were recovered. *Cosmocercoides dukae* was the most commonly occurring parasite, found in 11 host species. This is the first report of salamander parasites in Wisconsin.

Although there is an extensive literature on parasites of amphibians of the United States, most reports have dealt primarily with anurans. Much of this work has been reviewed by Yamaguti (1958), Walton (1964), and Ulmer (1970). However, excluding new species descriptions, there have been few investigations of the helminth parasites of salamanders (Harwood, 1932; Rankin, 1937, 1945; Fischthal, 1955). In the midwest, Dyer and Brandon (1973) investigated helminths of cave-dwelling salamanders of Illinois, Price and St. John (1980) and Price and Buttner (in press) studied the parasites of *Ambystoma texanum* and *Notophthalmus v. louisianensis* in Illinois, and Ulmer (1970) and Ulmer and James (1976) included *A. tigrinum* in their studies of the helminth fauna of Iowa amphibians. Brooks (1976) also collected *A. tigrinum* in his study of amphibian platyhelminths in Nebraska. Published accounts of the helminth fauna of Wisconsin amphibians are sparse. Williams and Taft (1980) studied the parasites of northwestern Wisconsin anurans. The present report is apparently the first survey of parasites from Wisconsin salamanders. At present there are eight salamander species endemic to Wisconsin; at least two specimens representing each species were collected during this investigation.

Materials and Methods

Amphibians were collected during March–October 1979 and May 1980, from Fond du Lac, Oneida, Portage, Rock, Sheboygan, and Waukesha counties, Wisconsin. Although most specimens were taken in spring, scattered collections continued during spring and summer. Animals were anesthetized in a solution of chlorotone or pithed, and examined for helminth parasites. Trematodes and cestodes were fixed in AFA, stained in borax carmine, and mounted in Canada balsam. Nematodes were killed in 70% ethanol, cleared in glycerol, and examined as temporary mounts. Further information concerning collection localities may be obtained from the authors. Voucher specimens of all parasites recovered have been deposited in the UNSM, Manter Helm. Coll. 20278–20281, 21343–21352.

Results and Discussion

One hundred-seventeen salamanders, representing eight species, were collected during this study. Forty-nine, 42%, were infected with one or more helminth parasite. Sixteen of 18 anurans (89%) were also found to be infected (Table 1).

Table 1. Helminth parasites collected from Wisconsin amphibians.

Parasite	No. infected hosts														Total (135,48)
	<i>Ambystoma laterale</i> (26,19)*	<i>Ambystoma maculatum</i> (20,35)	<i>Ambystoma tigrinum</i> (29,41)	<i>Ambystoma tremblyi</i> (2,50)	<i>Necturus maculosus</i> (6,67)	<i>Hemidactylium scutatum</i> (12,67)	<i>Notophthalmus v. louisianensis</i> (8,38)	<i>Plethodon cinereus</i> (14,64)	<i>Bufo americanus</i> (10,90)	<i>Hyla crucifer</i> (2,100)	<i>Rana clamitans</i> (1,100)	<i>Rana palustris</i> (2,100)	<i>Rana pipiens</i> (2,100)	<i>Rana sylvatica</i> (1,0)	
MONOGENEA															
<i>Sphyranura osleri</i> Wright, 1879	—	—	—	—	3 _u †	—	—	—	—	—	—	—	—	—	3
DIGENEA															
<i>Brachycoelium salamandrae</i> Dujardin, 1845	—	6 _{cr}	—	—	—	—	—	8 _{df}	—	—	—	1 _e	—	—	15
<i>Cephalogonimus salamandrus</i> Dronen and Lang, 1974	—	—	1 _g	—	—	—	—	—	—	—	1 _e	—	—	—	2
<i>Glypthelminis pennsylvaniensis</i> Cheng, 1961	—	—	—	—	—	—	—	—	—	2 _{df}	—	—	—	—	2
<i>Gorgoderina bilobata</i> Rankin, 1937	—	—	—	—	—	1 _f	—	—	6 _{dk}	—	—	—	—	—	7
<i>Gorgoderina attenuata</i> Stafford, 1902	—	—	—	—	—	—	—	—	—	—	—	1 _e	—	—	1
<i>Phyllodistomum americanum</i> Osborn, 1903	—	—	8 _{dk}	—	—	—	—	—	—	—	—	—	—	—	8
Unidentified metacercariae	—	—	2 _g	—	—	1 _f	—	—	—	—	—	—	—	—	3
CESTODA															
<i>Proteocephalus loennbergii</i> Fuhrmann, 1895	—	—	—	—	2 _g	—	—	—	—	—	—	—	—	—	2
NEMATODA															
<i>Cosmocercoides dukae</i> Holl, 1928	4 _{dfk}	4 _{df}	3 _g	1 _f	—	8 _f	3 _f	1 _d	5 _{dfk}	—	1 _e	2 _e	2 _e	—	34
<i>Oswaldocruzia pipiens</i> Walton, 1929	—	—	—	—	—	—	—	—	2 _{dfk}	—	—	—	—	—	2
<i>Rhabdias ranae</i> Walton, 1929	—	—	—	—	—	—	—	1 _f	4 _{dfk}	—	—	—	—	—	5
Unidentified spirurid cysts	1 _g	—	3 _g	—	—	—	—	—	—	—	—	—	—	—	4

* Numbers in parentheses refer to number of hosts collected and percentage infected.

† a = Fond du Lac Co. b = Milwaukee Co. c = Oneida Co. d = Portage Co. e = Rock Co. f = Sheboygan Co. g = Waukesha Co.

Nematodes comprised the bulk of the worm burden among both salamanders and anurans (Table 1). The most common nematode was *Cosmocercoides dukae* Holl, 1928, collected from the intestine in 11 of the 14 host species. However, the density of this nematode within each infected host remained low throughout the collection. Other nematodes collected included *Oswaldocruzia pipiens* Walton, 1929, found in the intestine of two *Bufo americanus* and *Rhabdias ranae* Walton, 1929, recovered from both *Plethodon cinereus* and *B. americanus*. Adults of two *R. ranae* were found in the lungs; juveniles inhabited the body cavity. Cysts containing an unidentified spirurid were found in the stomach wall of three *A. tigrinum* and one *A. laterale*.

Few digeneans were collected during this survey. *Brachycoelium salamandrae* Dujardin, 1845, was the most commonly recovered digenean and was found in both salamanders (*A. maculatum*, *P. cinereus*) and in *Rana palustris*. *Cephalogonimus salamandrus* Dronen and Lang, 1974, was found in four host species while *Glythelmins pennsylvaniensis* Cheng, 1961, occurred only in *Hyla crucifer*. The difficulty in identification of adult *C. salamandrus* has been discussed by Dronen and Lang (1974). In the present study, identification of this species was made from the adult and was confirmed by Brooks (personal communication).

The bladder fluke *Phyllodistomum americanum* Osborn, 1903, was commonly collected from *A. tigrinum* but was absent from all other hosts. One specimen of *Gorgoderina bilobata* Rankin, 1937, was found in the urinary bladder of *Hemidactylium scutatum*. The authors believe this to represent the first report of *Gorgoderina* sp. in a plethodontid salamander. *Gorgoderina attenuata* Stafford, 1902, and *G. bilobata* were recovered from the urinary bladder of *R. clamitans* and *B. americanus*, respectively. *Ambystoma tigrinum* and *H. scutatum* harbored unidentified metacercariae in the liver parenchyma.

Necturus maculosus is the only permanently aquatic salamander in Wisconsin. The monogenean *Sphyrnura osleri* Wright, 1879, was recovered from the gills of three hosts; the cestode *Proteocephalus loennbergii* Fuhrmann, 1895, occurred in the intestine of two *N. maculosus*.

The present study is the first survey of the helminth parasite fauna of Wisconsin salamanders. Lack of data on salamander parasites may indicate the difficulty of collecting these animals. In the current study most animals were collected during spring following melting of the normally heavy snow cover or during spring rains. The relatively sparse helminth parasite fauna of these salamanders may be a reflection of the time of collection. Animals were probably collected during their spring migration and before heavy feeding had begun. However, most anurans taken during the same period were more heavily infected. Results of the present study are consistent with previous reports of salamander parasites (Rankin, 1937; Dyer and Brandon, 1973; Price and St. John, 1980) although *A. tigrinum* was less heavily parasitized than reported by Ulmer (1970).

Acknowledgments

The authors wish to express appreciation to R. Price and Dr. W. Dyer, Southern Illinois University, for assistance in nematode identification. Dr. Daniel Brooks confirmed identification of *C. salamandrus*, *G. pennsylvaniensis*, *P. americanum*, and *P. loennbergii*. Dr. A. Williams and Tracy Day, UWM, assisted in field collections.

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