

## Occurrence of Swimmers' Itch In Northeast Indiana

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### Introduction

Swimmers' itch or schistosome cercarial dermatitis is a discomfort experienced by many persons each summer. It involves the development of red papular eruptions and intense itching on skin that has been exposed to water inhabited by snails that are infected with larval avian schistosomes. When avian schistosome cercariae accidentally penetrate the outer layers of human skin, they die near the point of entry, and a dermatitis reaction occurs around each parasite.

In recent years there have been many reports of outbreaks of swimmers' itch in North America and many studies of the prevalence of schistosomes in both intermediate and definitive hosts. None of the studies, however, have included Indiana.

The abundance of lakes in northeast Indiana and their heavy use for recreation during the summer months would suggest that cercarial dermatitis will occur if snails infected with schistosomes are present in the water. This study was undertaken in order to determine if infected snails are present, and if so, the prevalence and identification of, schistosomes in various snail species.

### Methods and Materials

At regular intervals during June, July, and August of 1984, snails were collected from the following sites on 5 natural lakes in northeast Indiana: (1) the southwest corner of Tippecanoe Lake in Kosciusko Co., (2) the Crooked Lake Biological Station on the north side of Crooked Lake in southern Noble Co., (3) the northwest corner of Loon Lake in Steuben Co., (4) the south side of Crooked Lake in Steuben Co., and (5) the south side of Jimmerson Lake in Steuben Co. Snails of all sizes were collected by hand in shallow water along the shore.

The following criteria were used in the selection of collecting sites: (1) the presence of humans engaged in activities that expose them to water, (2) the presence of bird species known to harbor dermatitis-producing schistosome adults, and (3) the presence of snails from each of three pulmonate families (Physidae, Lymnaeidae, and Planorbidae) known to serve as intermediate hosts for avian schistosomes.

Snail species examined were *Physa gyrina* (Physidae), *Lymnaea* sp. and *Pseudosuccinea columella* (Lymnaeidae), and *Gyraulus* sp., *Promenetus exacuous*, and *Planorbula armigera* (Planorbidae). Snails were placed in small culture jars (5-10 per jar) of filtered lake water and kept for 2 days under normal light conditions. Water was checked 3 times each day for the presence of emerged cercariae. If cercariae were found, snails from that jar were isolated in small vials. Numbers of snails shedding cercariae, sizes of snails, and all cercarial types were recorded.

Schistosome cercariae were examined while alive and also after being fixed in hot 5% formalin. Measurements were taken of 10 formalin-fixed cercariae from each snail infected with schistosomes. Identification was made on the basis of these measurements and the morphology and behavior of living cercariae.

To determine if the cercariae isolated from snails were able to produce a skin reaction (cercarial dermatitis), several from each infected snail were placed on the skin of the author's arm. This technique works quite well because the author is sensitized to most species of avian schistosomes.

### Results

Of the 7,835 snails examined during the summer of 1984, only 21 (0.27%) harbored patent schistosome infections (Table 1). These occurred in *Physa gyrina* (13), *Pseudosuccinea columella* (7), and *Promenetes exacuus* (1).

TABLE 1. Patent infections of avian schistosomes and all trematode species in pulmonate snails from northeast Indiana.

Snail Host	Total No. Collected	No. of Patent Infections (%)	
		Avian Schistosomes	All Trematode Spec.
<i>Physa gyrina</i>	2326	13 (0.56%)	78 (3.35%)
<i>Lymnaea</i> sp.	688	0 (0.0 %)	9 (1.31%)
<i>Pseudosuccinea columella</i>	962	7 (0.73%)	74 (7.69%)
<i>Gyraulus</i> sp.	2317	0 (0.0 %)	126 (5.44%)
<i>Planorbula armigera</i>	1042	0 (0.0 %)	5 (0.48%)
<i>Promenetes exacuus</i>	500	1 (0.20%)	34 (6.80%)
TOTALS	7835	21 (0.27%)	326 (4.16%)

*Pseudosuccinea columella* (7), and *Promenetes exacuus* (1). No schistosome infections were found in the other 3 snail species. Patent infections of all trematode species occurred in 4.16% of the snails examined. *Pseudosuccinea columella* had the highest total infection rate (7.69%), as well as the highest schistosome infection rate (0.73%).

Snails harboring patent schistosome infections were collected at only 3 of the 5 study sites (Crooked Lake Biological Station, Tippecanoe lake, and Loon Lake). The author experienced cercarial entry into the skin (dermatitis) while collecting at each of these localities and also while collecting at Jimmerson Lake on one occasion. Infected snails were not collected at this site, however.

Four species of schistosomes were recovered during this study (Table 2). The species most frequently recovered was *Gigantobilharzia huronensis* from 9 individuals of *P. gyrina*. Another species of this genus, *G. elongata*, was found in 1 *P. exacuus*. One species of *Trichobilharzia* (probably *T. physellae*) was recovered from 4 *P. gyrina*, and a second species of *Trichobilharzia* occurred in 7 *P. columella*. All 4 of these schistosome species produce cercarial dermatitis.

Prevalence of infection for each schistosome species collected during the summer of 1984 was determined for every collection period (Table 2). These data suggest that patent infections of each species may be limited to specific, relatively short time periods. *G. elongata* in *P. exacuus* and *Trichobilharzia* sp. in *P. gyrina* were found only during the first half of June. *P. gyrina* infected with *G. huronensis* were collected from mid-June to mid-July, while *Trichobilharzia* sp. infections in *P. columella* were limited to the last 3 collections of the summer (July 24, August 8, and August 23).

### Discussion

Although prevalence of schistosomes in snails of northeast Indiana, as determined by this study, is quite low (0.27%), the presence of infected snails at 3 of the 5 collecting sites and the contraction of dermatitis by the author at 4 sites indicate that persons using these lakes for recreation could develop swimmers' itch.

Prevalence of schistosomes is frequently low, even in surveys done at the time of outbreaks of dermatitis. Lane et al. (9) found 1.1% of *Physa* sp. and 2.3% of *Gyraulus*

TABLE 2. Prevalence of infection for each schistosome species found in snails collected during June, July, and August 1984 ( $\frac{\text{number of snails infected}}{\text{number of snails collected}}$ ).

Schistosome and host	June			July			August		Totals
	4	14	23	2	12	24	8	25	
<i>Gigantobilharzia</i> <i>elongata</i> in <i>P. exacuouus</i>	$\frac{0}{96}$	$\frac{1}{84}$	$\frac{0}{26}$	$\frac{0}{51}$	$\frac{0}{72}$	$\frac{0}{51}$	$\frac{0}{100}$	$\frac{0}{20}$	$\frac{1^a}{500}$
<i>Gigantobilharzia</i> <i>huronensis</i> in <i>P. gyrina</i>	$\frac{0}{105}$	$\frac{2}{368}$	$\frac{1}{431}$	$\frac{1}{465}$	$\frac{5}{422}$	$\frac{0}{184}$	$\frac{0}{173}$	$\frac{0}{178}$	$\frac{9^b}{2326}$
<i>Trichobilharzia</i> sp. in <i>P. gyrina</i>	$\frac{2}{105}$	$\frac{2}{368}$	$\frac{0}{431}$	$\frac{0}{465}$	$\frac{0}{422}$	$\frac{0}{184}$	$\frac{0}{173}$	$\frac{0}{178}$	$\frac{4^c}{2326}$
<i>Trichobilharzia</i> sp. in <i>P. columella</i>	$\frac{0}{21}$	$\frac{0}{47}$	$\frac{0}{79}$	$\frac{0}{102}$	$\frac{0}{108}$	$\frac{2}{186}$	$\frac{3}{224}$	$\frac{2}{195}$	$\frac{7^a}{962}$

<sup>a</sup>all from Biological Station.  
<sup>b</sup>3 from Biological Station, 6 from Loon Lake.  
<sup>c</sup>3 from Biological Station, 1 from Tippecanoe Lake.

sp. infected after a dermatitis outbreak in Alameda Co., California. Likewise, Howard and Walden (6) found 3% of *Lymnaea emarginata* infected with schistosomes after a dermatitis outbreak at Cultus Lake, British Columbia.

In two recent studies done in southwest Michigan on large populations of snails, 0.19% of *Physa integra* from Gunn Lake in Barry Co. were infected with schistosomes (7), and 2.54% of *Gyraulus parvus* from Wintergreen Lake in Kalamazoo Co. were infected (8). The higher infection rate at Wintergreen Lake might be expected since this lake is located at the Kellogg Bird Sanctuary, where many species of waterfowl reside. None of the 2,317 *Gyraulus* sp. in the present study was infected even though waterfowl were seen at every collecting sight.

The schistosome cercariae found in *P. columella* collected at Crooked Lake Biological Station were not identified to species. In structure and behavior they closely resemble certain species of *Trichobilharzia*. Adult worms derived from experimental infections using these cercariae would be useful. Attempts to produce experimental infections in chickens exposed to these cercariae were unsuccessful, however.

*Trichobilharzia* cercariae have not previously been reported from *P. columella*. Rankin (13) found schistosome cercariae in this snail in western Massachusetts, but did not describe them. Both species of mammalian schistosomes (*Heterobilharzia americana* and *Schistosomatium douthitti*) found in the United States may use *P. columella* as a definitive host (10, 11).

*Trichobilharzia* sp. found in *P. gyrina* closely resembles *T. physellae* described by Talbot (15). There are a number of species of this genus that use physid snails as intermediate hosts (3), however, and experimental exposures to determine the adult are necessary.

*G. elongata* cercariae were described by Brackett (1) from *Gyraulus parvus* collected near Madison, Wis. Grodhaus (4) found this species in *Gyraulus* sp. in California. The occurrence of *G. elongata* in *P. exacuouus* constitutes a new host record. Adults of this species are found in pied-billed grebes (5).

*G. huronensis*, which was found in this study in *P. gyrina*, was described by Najim from this same host species from the Huron River near Ann Arbor, Michigan (12). The adult worms are found in a number of species of passerine birds (2, 12,

14). In the present study, part of each collecting site was near a stand of cattails where redwinged blackbirds were nesting in early summer. They were probably the source of infection for the snails.

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