

1968

## Schistosome Dermatitis at Basswood Lake, Minnesota

James A. Zischke  
*St. Olaf College*

Deloris Palmquist Zischke  
*Louisiana State University*

Follow this and additional works at: <https://digitalcommons.morris.umn.edu/jmas>



Part of the [Zoology Commons](#)

---

### Recommended Citation

Zischke, J. A., & Zischke, D. P. (1968). Schistosome Dermatitis at Basswood Lake, Minnesota. *Journal of the Minnesota Academy of Science*, Vol. 35 No. 1, 29-32.

Retrieved from <https://digitalcommons.morris.umn.edu/jmas/vol35/iss1/8>

This Article is brought to you for free and open access by the Journals at University of Minnesota Morris Digital Well. It has been accepted for inclusion in Journal of the Minnesota Academy of Science by an authorized editor of University of Minnesota Morris Digital Well. For more information, please contact [skulann@morris.umn.edu](mailto:skulann@morris.umn.edu).



# Schistosome Dermatitis at Basswood Lake, Minnesota\*

JAMES A. ZISCHKE\* and DELORIS PALMQUIST ZISCHKE\*\*

**ABSTRACT** — During the summer of 1965 cases of schistosome dermatitis were reported at the Associated Colleges of the Midwest Wilderness Field Station on Basswood Lake, Minnesota. Collection and isolation of gastropods from the lake revealed an extremely high incidence of *Trichobilharzia ocellata* infections in *Lymnaea stagnalis*. A flock of semi-domestic mallard ducks first introduced at the lake in 1963 are believed to be the principal definitive hosts contributing to the epidemiology of the parasite in the area.

Cort (1928) was the first to demonstrate that the cercariae of certain nonhuman schistosomes can penetrate unbroken human skin and produce a dermatitis characterized by papular eruptions. The cercariae of approximately 25 species of bird and mammal schistosomes have been reported as the etiological agents for this type of dermatitis (Cort, 1950 and Malek, 1961). Human infections have been recorded from fresh, brackish and marine waters and from nearly every continent. The dermal manifestations caused by these trematode larvae are known locally by a variety of names, e.g., "swamp itch," "clam digger's itch," "gulf-coast itch" and "swimmer's itch."

In Minnesota "swimmer's itch" has no doubt been a problem of considerable magnitude. Studies by Brackett (1940), McMullen and Brackett (1941) and McMullen and Beaver (1945) in Wisconsin, by Ulmer (1958) in Iowa and by McLeod (1940) in Manitoba illustrated the prevalence of schistosome dermatitis in areas adjacent to Minnesota, and there is no reason to doubt its widespread occurrence in this state. However, only two reports of studies on "swimmer's itch" in Minnesota are found in the literature. Christenson and Greene (1928) reported finding specimens of *Lymnaea stagnalis appressa* infected with *Cercaria elvae* in "four small lakes in the vicinity of the Twin Cities." The cercariae of *Trichobilharzia ocellata* (from *Lymnaea stagnalis jugularis*) and *T. stagnicola* (from *Stagnicola emarginata serrata*) were reported as causes of "swimmer's itch" by Elliott (1942) in Lake Bemidji and Grace Lake in Northern Minnesota. More recently, Larson (1961) surveyed the larval trematodes in the snails of Lake Itasca and reported the occurrence of the cercariae of *Schistosomium douthitti* and a species of *Trichobilharzia* (in *L. stagnalis*) both of which produce human dermatitis.

During the summer of 1964 studies on the trematode fauna of Basswood and adjacent lakes in the Superior National Forest were initiated. Among the snails from these original collections were several specimens of *L.*

*stagnalis* which were shedding dermatitis-producing cercariae believed to belong to the genus *Trichobilharzia*. A more extensive study was then undertaken in the summer of 1965 to determine the prevalence and relative importance of the various species of bird and mammal schistosomes in the epidemiology of schistosome dermatitis in the immediate vicinity of the Associated Colleges of the Midwest (ACM) Field Station and the Quetico-Superior Wilderness Research Center on Basswood Lake.

## Materials and Methods

Snails from field collections were isolated for 24 hours in 50 ml ointment jars. At the end of this period the contents of the jars were examined for emerged cercariae with the aid of a stereomicroscope. Specimens of the cercariae obtained in this manner were examined with the compound microscope and identified as exactly as possible. Line drawings of the different schistosome cercariae were made with the aid of a camera lucida.

Limited attempts were made to determine which vertebrate hosts were contributing to the epidemiology of the schistosome dermatitis in the area. Fecal samples from ducks feeding in the bays adjacent to the station were collected and examined for the presence of the schistosome eggs. In addition, one specimen of the semi-domestic breed of mallard ducks common in the area was captured and sacrificed. The visceral blood vessels of this bird were thoroughly examined for adult worms. Similar examinations were carried out on several specimens of small rodents (species of *Peromyscus* and *Microtus*) trapped in the immediate vicinity.

## Results

**Locality.** Three small bays of Basswood Lake are located adjacent to the Quetico-Superior Research Center and the ACM Field Station (Fig. 1). During the summer of 1965 cases of "swimmer's itch" were acquired by residents of the two facilities from all three of these bays.

**Snail host.** Snail collections made in the bay adjacent to the Research Center yielded 20 specimens of *Lymnaea stagnalis* (Fig. 2) all of which were shedding schistosome cercariae. In the "boat bay" of the ACM Field Station 22 of 27 specimens of this same species of snail were found to be infected with schistosome larvae. *L. stagnalis* was also found in small sheltered embayments of the lake on the shore line extending away from the "boat bay" toward "picnic point." The percentage of infected snails

\* J. A. Zischke: B.S., University of Wisconsin; M.A. University of South Dakota; Ph.D., Tulane University. Currently Assistant Professor of Biology St. Olaf College.

\*\* D. P. Zischke: B.S. and M.A., University of South Dakota. Currently working on Ph.D. Louisiana State University.

Supported by National Science Foundation ACM Faculty Research Stipend.

The authors wish to thank Dr. Robert Drexler and Dr. David Lyon for assistance in making snail collections.



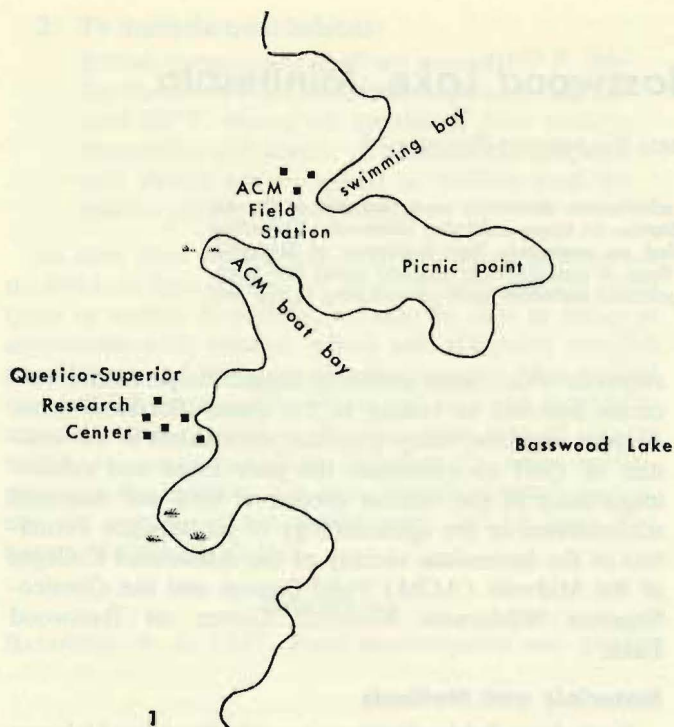


FIGURE 1. Schistosome dermatitis study area near ACM and Quetico-Superior Field Stations.

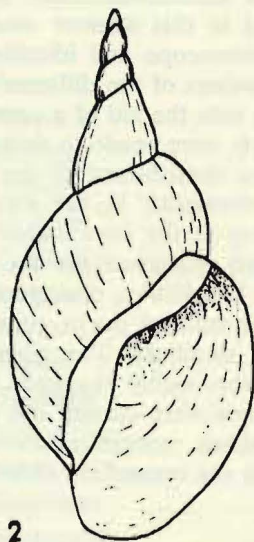


FIGURE 2. Schistosome dermatitis snail vector, *Lymnaea stagnalis*.

decreased progressively as collections were made at increasing distances away from the "boat bay." In the ACM "swimming bay" from which at least one case of "swimmer's itch" was reported, only five specimens of *L. stagnalis* were collected, none of which was found to be shedding schistosome cercariae. The snail collections, therefore, made in this area showed a definite pattern of increasing prevalence of schistosome infections along the shore line extending from the "swimming bay" to the bay adjacent to the Research Center.

*Cercaria*. The following description of the schistosome

cercaria recovered from *L. stagnalis* is based on observations made on numerous living specimens and measurements of fifty specimens fixed in hot 10 percent formalin. All measurements are in millimeters.

Description (Fig. 3): Apharyngeate, furcocercous, distomate with oral sucker replaced by protrusible cephalic organ. Body 0.304 to 0.321 long by 0.064 to 0.070 wide at midbody. Tail stem, measured from body-tail junction to base of furcae laterally, 0.390 to 0.410 long by 0.038 to 0.042 wide at base. Furcae, 0.220 to 0.263 long by 0.020 to 0.023 wide at base. Fin folds present on dorsal and ventral surface of furcae. Body and entire tail covered with spines. Penetration organ pyriform, 0.080 to 0.084 long by 0.037 to 0.041 wide at widest point. Mouth minute, ventral, subterminal. Esophagus narrow, bifurcating a short distance posterior to eye spots. Ceca short, terminating anterior to acetabulum. Acetabulum, 0.030 to 0.032 long by 0.032 to 0.035 wide, located just posterior to midbody. Six large penetration glands on each side extending from level just posterior to eye spots to excretory bladder. First gland visible only in cercariae dissected from sporocysts. Single bundle of gland ducts on each side extending from level of anterior-most gland to terminate and discharge through individual pores at anterior end of penetration organ. Pore of each duct marked by small papilla and spine. Excretory bladder bipartite, each half giving rise to posterior excretory duct which surround Island of Cort and reunite at body-tail junction forming a single duct extending through tail stem. Caudal excretory duct bifurcating at furcal junction and discharging at tips of furcae. Main excretory tubule on each side of body extending to level of posterior border of acetabulum, receiving long

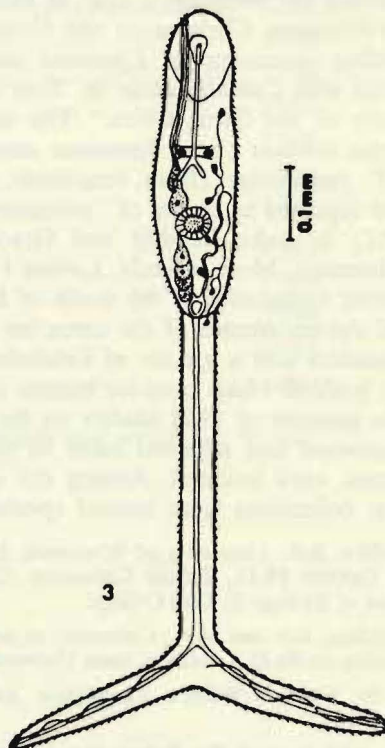


FIGURE 3. *Trichobilharzia ocellata* cercaria.



anterior collecting tubule and short posterior tubule. Flame cell formula 2 [ (1+1+1) + (1+1+1) ] with one pair of flame cells in base of tail. Eye spots circular, 0.007 in diameter. Cephalic ganglia bipartite dorsal to gut and penetration glands and anterior to eye spots, parts connected by a cross commissure.

The foregoing description of the schistosome cercaria from *L. stagnalis* agrees closely with the descriptions of *Cercaria elvae* reported by Miller (1923) and Talbot (1936) from the same species of snail host in Michigan. McMullen and Beaver (1945) subsequently demonstrated that *C. elvae* was the cercaria of *Trichobilharzia ocellata*, the adult schistosome found naturally occurring in wild ducks (mallard and teal). It was concluded, therefore, that the cercariae collected from *L. stagnalis* during the current studies were the larvae of *T. ocellata*.

Cercariae of *T. ocellata* were also recovered from specimens of *L. stagnalis* collected from a small lake (Hula Lake), several miles east of Basswood Lake. In addition, a single specimen of *Stagnicola emarginata angulata* collected near a gull rookery in the northern part of Basswood Lake was found to be infected with a schistosome, tentatively identified as *Trichobilharzia stagnicola*.

**Definitive host.** The attempts to identify the definite hosts for the schistosome cercariae collected during this study were only moderately successful. Typical spindle-shaped eggs of *Trichobilharzia* were discovered in about one-fourth (13 of 51) of the samples of duck feces collected at random in the vicinity of the Research Center and the ACM Field Station. No schistosomes were recovered from the one duck and four specimens of rodents (three *Peromyscus* and one *Microtus*) examined during this study.

## Discussion

During the summer of 1965 six persons residing at the ACM Wilderness Field Station and the Quetico-Superior Research Center on Basswood Lake suffered rather severe cases of "swimmer's itch" while bathing in the bays near these facilities. It is probably that a number of other residents developed milder infections of the same type.

The pathology in these cases was a typical schistosome dermatitis marked by the formation of macules, which were later replaced by papules, which in most cases became vesicular one to two days after exposure and then gradually disappeared in about one week. Severe itching accompanied the infection during the first few days.

The number of cases of "swimmer's itch" reported in this area is not surprising considering the extremely high incidence of infected snails particularly in the ACM boat bay and the bay adjacent to the Research Center. These two bays provide the best habitat for *L. stagnalis*, i.e., muddy bottom, abundant attached vegetation and protection against wind and wave action. In the ACM "swimming bay" where the traffic of bathers was greatest, the habitat was much less suitable for this schistosome vector (mainly sand bottom with considerable

wave action and little vegetation). This is the main reason why the number of human infections noted was not greater. The distribution of *L. stagnalis* was by no means uniform in the other two bays, but nearly 90 percent of the snails found there were infected with *T. ocellata* and each snail with a mature infection released several thousand cercariae each day. It is obvious, therefore, that an individual could easily have encountered a swarm of these trematode larvae when swimming or wading in either of these areas.

*L. stagnalis* was found to be distributed in other localities in the region having similar aquatic habitats. The occurrence of snails harboring schistosome infections was, however, far less common in these areas. It appears, therefore that *T. ocellata* is widespread although irregularly distributed throughout the region. Another species of schistosome, *T. stagnicola* was also found to infect *Stagnicola emarginata angulata*. However, this trematode-snail complex did not contribute to the outbreak of dermatitis studied and no conclusion could be drawn regarding its importance in other areas.

Although it has been established that only one species of snail (*L. stagnalis*) and one species of schistosome (*T. ocellata*) contributed to the epidemiology of "swimmer's itch" in this area, no absolute evidence was gathered concerning the definitive hosts involved. However, the evidence obtained strongly suggests that the relatively large population of semi-domestic ducks in the area is the primary factor responsible for the high incidence of this parasite.

During the summer of 1963 approximately 500 ducklings (a domestic breed of mallard) were released near the Quetico-Superior Research Center. Sizeable numbers of these ducks and their progeny have been returning to the area each summer to breed. In addition, wild mallards have no doubt become mixed with this group to some extent. In 1965 approximately 100 of these birds returned to the area and were fed and remained in the vicinity of the Research Center.

It is interesting to note that the highest incidence of snails infected with *T. ocellata* was in the bay adjacent to the Research Center where these ducks were most abundant and that the percentage of infected *L. stagnalis* decreased in areas more distant from this bay where the ducks were less commonly seen. Moreover, eggs believed to be those of *Trichobilharzia* were observed in sizeable numbers (approx. 25%) of the fecal samples examined. Notably also, the only natural hosts thus far reported for the adults of *T. ocellata* are mallard and teal ducks. None of the vertebrate hosts, including one specimen of the local duck population examined during this study were found to harbor schistosome infections. However, time did not permit a more extensive study of the possible vertebrate hosts.

It is concluded, from this largely indirect evidence, that the local population of semi-domestic ducks plays a primary role in the epidemiology of *T. ocellata* in this area. Future studies will be directed toward elucidating the contributions to the epidemiology of this infection made by ducks and possibly other vertebrate hosts and to



acquire a clearer understanding of the ecological and host-parasite relationships involved in maintaining the life cycle of this parasite.

### References

- BRACKETT, S. 1960. Two new species of Schistosome Cercariae from Wisconsin. *J. Parasitol.* 26:195-200.
- CORT, W. W. 1928. Schistosome Dermatitis in the United States (Michigan). *J. Amer. Med. Assoc.*, 90:1027-1029.
- 1950. Studies on Schistosome Dermatitis. XI. Status of Knowledge After More Than Twenty Years. *Amer. J. Hyg.*, 52:251-307.
- CHRISTENSON, R. O. AND GREENE, W. P. 1928. Studies on Biological and Medical Aspects of "Swimmer's Itch" Schistosome Dermatitis in Minnesota. *Minnesota Med.*, 11:573-575.
- ELLIOTT, A. M. 1942. The Present Status of "Swimmer's Itch" in Northern Minnesota. *Proc. Minnesota Acad. Sc.*, 10:15-16.
- MALEK, E. A. 1961. The Biology of Mammalian and Bird Schistosomes. *Bull. Tulane Med. Fac.*, 20:181-207.
- MCLEOD, J. A. 1940. Studies on Cercarial Dermatitis and the Trematode Family, Schistosomatidae in Manitoba. *Canad. J. Res. (Sect. D)*, 20:170-181.
- MCMULLEN, D. B. AND BEAVER, P. C. 1945. Studies on Schistosome Dermatitis. IX. The Life Cycles of Three Dermatitis-Producing Schistosomes from Birds and a Discussion of The Subfamily Bilharziellinae (Trematoda: Schistosomatidae). *Amer. J. Hyg.*, 42:128-154.
- MCMULLEN, D. B. and BRACKETT, S. 1941. The Distribution and Control of Schistosome Dermatitis in Wisconsin and Michigan. *Amer. J. Trop. Med.*, 21:725-729.
- MILLER, H. M. 1923. Notes on Some Furcocercous Larval Trematodes. *J. Parasitol.*, 10:35-46.
- TALBOT, S. B. 1936. Studies on Schistosome Dermatitis. II. Morphological and Life History Studies of Three Dermatitis-Producing Schistosome Cercariae, *C. elvae* Miller, *C. stagnicola*, n.sp. and *C. physellae*, n.sp. *Amer. J. Hyg.*, 23:372-384.
- ULMER, M. J. 1958. Schistosome Dermatitis at Lake Okoboji, Iowa. *J. Parasitol.*, 44(Suppl.):13.

## Learned Societies Around the World

### United Kingdom of Great Britain and Northern Ireland

*British Association for the Advancement of Science.* Founded 1831. Promotes general public interest in the natural sciences. Membership is open to all persons interested in this field. Publications: a quarterly, "The Advancement of Science."

*Royal Society* (of London for the Improvement of Natural Knowledge). Founded 1660. Concerned with the promotion of all branches of the natural sciences. Members are distinguished scientists in all fields. Members also include foreign scientists. Publications: Annual report of activities: yearbook; "Philosophical Transactions" and other journals. Also concerned with the financing of research.

*Royal Society of Edinburgh.* Founded 1783. Devoted to promotion of the natural sciences and literature. Has over 800 members. Publications: Annual reports; yearbooks; and journals in the fields of mathematics, physics, biology, and geology.

*British Academy in London.* Founded 1901. Divided into 11 sections and promotes the arts and humanities. Publications: Yearbook.

*Royal Institution of Great Britain* in London. Founded 1799. Main function is promotion of natural sciences. Lectures are arranged for members of Institution, friends, and young people. Maintains large library and laboratories of its own. Publications: Three reports a year.

*Royal Scottish Academy in Edinburgh.* Founded 1826. Promotes natural sciences. Maintains large library. Publications: Proceedings and reports.