



The State of Swimmer's Itch on Crystal Lake—2023

Assessment Report October 15, 2023

by

Curtis L. Blankespoor, Ph.D.
and
Randall De Jong, Ph.D.

*This report was written for the Crystal Lake & Watershed Association (CLWA), a non-profit 501 (c) (3) group of concerned citizens committed to protecting the beauty and water quality of Crystal Lake and its surrounding environment. The CLWA engages in monitoring, education, and advocacy on behalf of the broad community for whom Crystal Lake is a vital economic, recreational, and aesthetic resource.

----- *SPECIALIZING IN EDUCATION AND CONTROL* -----

Executive Summary

Six summers ago (2016) the CLWA contracted with SICON, LLC to collect extensive swimmer's itch (SI) baseline data. In the summer of 2017, under the authority of federal and state permits, all common merganser broods were trapped and relocated off Crystal Lake. Not surprisingly, two metrics of the swimmer's itch (SI) problem — snail infection levels and cases of SI (measured by reports to our website, and more scientifically, by the annual study at the Congregational Summer Assembly beach) — showed dramatic decreases in all years (2018-2021) following a summer of brood relocation.

However, in 2022 and 2023, the common merganser brood relocation program was suspended by MI-DNR because of highly pathogenic avian influenza (HPAI). With this suspension, it was expected that both metrics would soon return to pre-relocation levels, and indeed they did. In fact, it only took one summer (2022) of common merganser broods growing up on the lake for snail infection levels to dramatically increase the following year (2023). Naturally, SI case reports to our website and in the CSA beach study (to our knowledge) also spiked. The combination of these data strongly attest to the efficacy of the relocation program.

Introduction

Swimmer's itch, also known as schistosome cercarial dermatitis, is a common problem in many recreational lakes throughout the northern United States and the world. It can be caused by any of over 70 different avian schistosome parasite species that mistakenly penetrate human skin instead of the skin of their natural definitive host. When this happens, the parasite dies at the site of penetration causing an inflammation of the skin and the formation of a papule. Swimmer's itch papules can itch intensely for up to 10 days.

Brief Review of Avian Schistosome Life Cycles

All avian schistosome species have a similar two-host life cycle. As adults they live within a definitive host, most commonly a duck; when sexually mature the worms release their eggs, which make their way into the feces of their host. If these feces land in water, eggs of the parasite hatch into larval stages (miracidia), which are infective to an appropriate species of snail (the intermediate host). Upon finding a suitable snail, the miracidium will penetrate the soft tissue and develop within its digestive glands. Over the next 30 days it matures and then produces thousands of cercariae that are released into the water every day, especially during the warm-water summer months. If a cercaria locates the correct vertebrate host species, it penetrates and develops into an adult worm to complete its life cycle. If a cercaria accidentally penetrates human skin, it dies in the skin, and an immune reaction can result, usually causing a raised papule that can itch intensely.

In many northern Michigan lakes, severe outbreaks of swimmer's itch have predominantly and most commonly been attributed to the avian schistosome, *Trichobilharzia stagnicola*. This parasite species utilizes the common merganser (*Mergus merganser*) as its definitive host and *Stagnicola emarginata* as its intermediate (snail) host.

Important Fact to Remember: Given the life cycle of *T. stagnicola*, and the biology of its hosts, infected common merganser broods affect the **following summer's** snail infection levels.

Snail Infection Levels

Summary of work completed: A comprehensive avian schistosome species assessment in 2016 identified *Trichobilharzia stagnicola* (carried in *Stagnicola emarginata* snails) as the dominant swimmer's itch causing species on Crystal Lake. Since then, infection levels in this snail species have been monitored during the 2018, 2020, 2022, and 2023 summers. (Table 1).

Table 1. The percentage of *Stagnicola emarginata* snails infected with swimmer's itch at ten different locations on Crystal Lake (Benzie County, MI) in 2016, 2018, 2020, 2022, and 2023. Data from July 2016 serve as a pre-program baseline, as the CLWA initiated swimmer's itch control efforts in 2017. The number in parenthesis indicates the total number of snails examined. Color of cell indicates infection level. (■ = Ideal (<0.24%), ■ = Tolerable (0.25-0.49%), ■ = Moderate (0.5-0.9%), ■ = Severe (1.0-1.9%), ■ = Epidemic (>2.0%))*

Control Program	Common Merganser Broods Pre-program Baseline Trapped and Relocated (Our program started in 2017)			MI-DNR suspends Common Merganser Control Policy	
	Year 0	Year 2	Year 4	Year 6	Year 7
Location	2016 July 20	2018 July 12-13	2020 July 6	2022 July 13	2023 July 12
River Outlet (L11)	1.0% (200)	0.0% (199)	0.0% (220)	0.67% (300)	5.45% (202)
Onkeonwe Rd (J11)	2.5% (200)	0.0% (200)	0.0% (212)	0.0% (250)	0.0% (218)
CBCA (G7)	1.0% (200)	0.0% (228)	0.0% (230)	0.0% (250)	0.0% (211)
CSA (A6)	0.5% (200)	0.46% (216)	0.0% (212)	0.0% (185)	0.43% (230)
Marquette Ct (A5)	3.5% (200)	0.46% (216)	0.0% (230)	0.0% (198)	2.27% (220)
Yacht Club (A3)	0.0% (200)	0.0% (216)	0.0% (220)	0.0% (197)	1.42% (212)
M6 Hotspot (M6)	1.0% (200)	1.38% (217)	0.0% (212)	0.45% (224)	0.46% (218)
Nichols Rd (O7)	0.0% (200)	0.0% (216)	0.0% (226)	0.0% (218)	0.00% (219)
Orchard Hill (R9)	0.50% (200)	0.0% (204)	0.0% (220)	0.0% (3)	0.91% (220)
Beulah Beach (Q13)	0.50% (200)	0.5% (200)	0.44% (229)	0.0% (204)	1.28% (235)
Lake-wide	1.05% (2000)	0.28% (2112)	< 0.05% (2211)	0.15% (2029)	1.19% (2185)

*While these various levels and categories (ideal, tolerable, moderate, severe, epidemic) might seem arbitrary, they are based on decades of professional experience working on swimmer's itch on numerous lakes in the USA.

Conclusion: Remarkably, it only took 1 year for snail infection levels to soar to levels not seen since before the relocation program began. These data, which are the “experiment” that no one wanted to see happen, prove beyond any doubt that common merganser brood relocation is highly effective at Crystal Lake.

Waterfowl Surveys

Summary of work completed: Waterfowl surveys of the entire shoreline of Crystal Lake were conducted in 2022 (Figure 1) and 2023 (Figure 2).

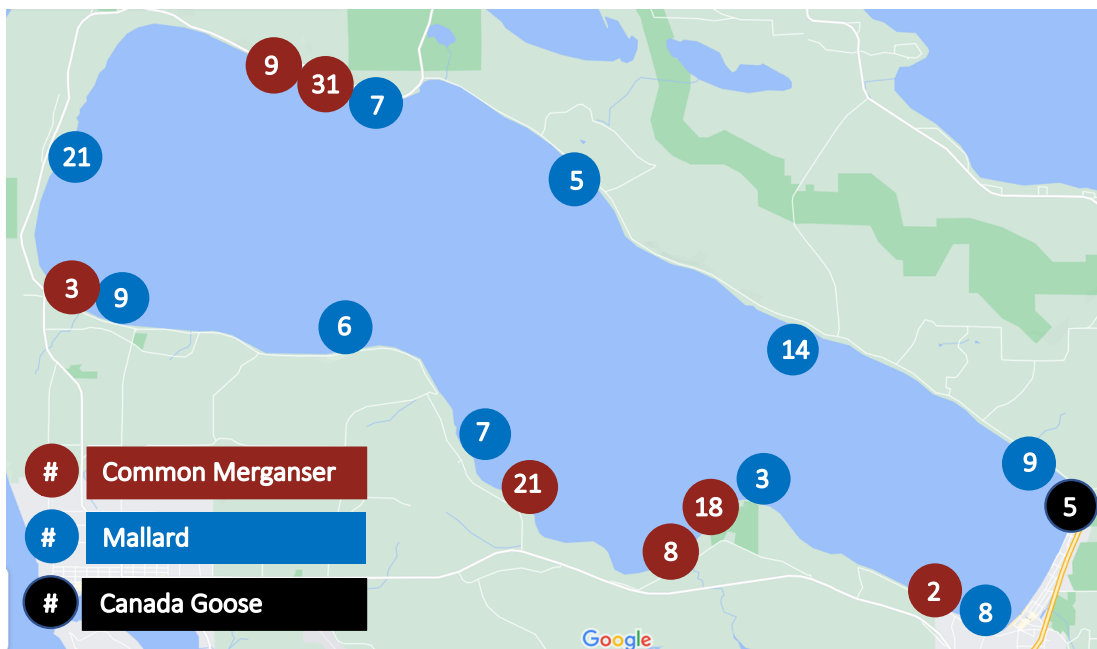


Figure 1. Number of common mergansers, mallards, and Canada geese observed during a July 27, 2022 shoreline survey of Crystal Lake (Benzie County, MI).

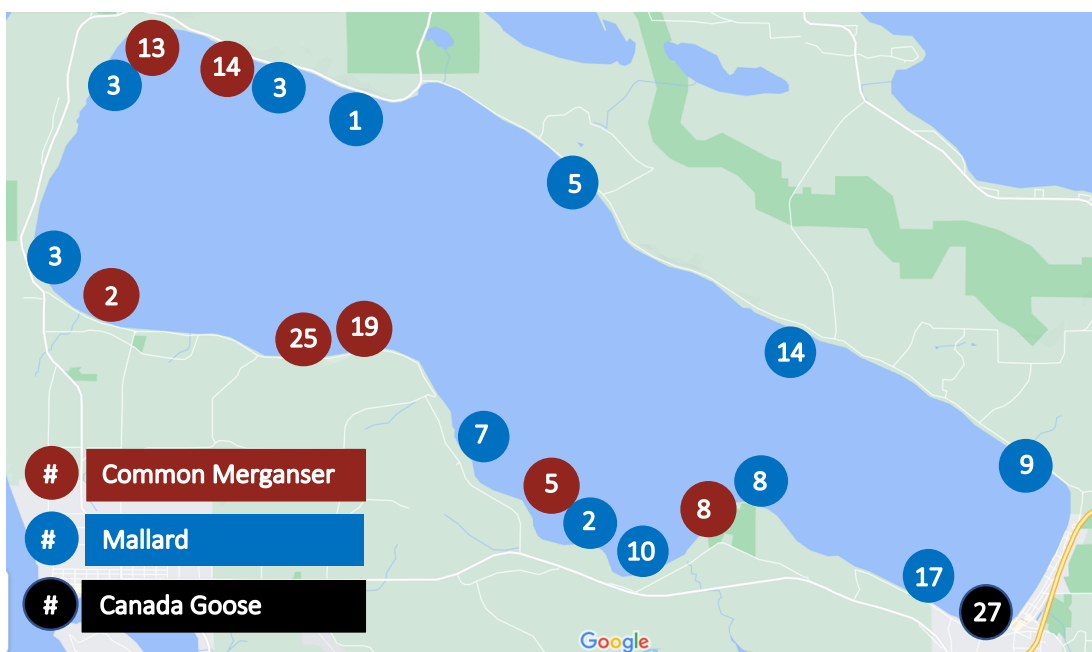


Figure 2. Number of common mergansers, mallards, and Canada geese observed during a July 12, 2023 shoreline survey of Crystal Lake (Benzie County, MI).

Website SI Reports

Summary of work completed: From the beginning of the relocation program, SIS has hosted a website where Crystal Lake residents and visitors can report SI cases. These data are only a rough measure of the SI issue on Crystal Lake because it does not include any reporting of times that individuals used the water *without getting SI*. In addition, the rate of reporting probably varies depending on the prior expectations of the person getting in the water, the severity of the case, and the motivation for reporting.

In Figure 3 below, the numbers of SI case reports from 2017-2023 are plotted, broken down by case severity (Mild = 1-10 papules, Medium-High = 11-99 papules, Severe = 100+ papules). In 2023, the number of reports was 241, far exceeding any other year (average 45 reports/year, range 16-68 reports/year). This undoubtedly is a result of the significant jump in snail infection prevalence seen in 2023 due to the 9 common merganser broods left on the lake in summer 2022. It also probably reflects frustration among the public leading to a high motivation to report. In addition, one can see that the high number of cases in 2023 is not due to an overreporting of mild cases.

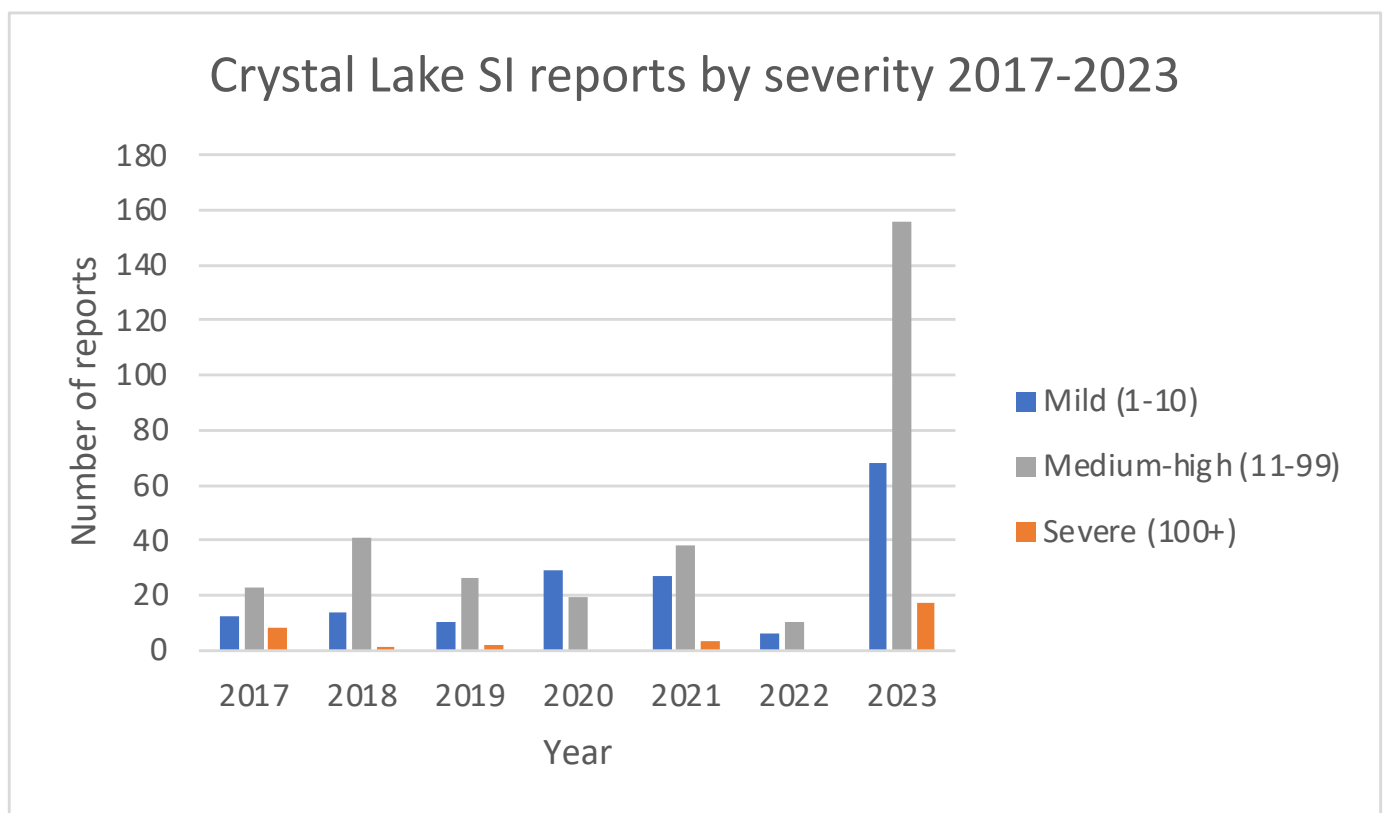


Figure 3. Crystal Lake 2017-2023 SI case reports categorized by severity.

Plotting 2023 cases geographically shows that cases were frequent all around the lake (Figure 4), which reflects that merganser broods use the entire lake (Figures 1 and 2). Cases are most frequent at the CSA and Beulah beaches, as is expected due to the high number of visitors to those locations.



Figure 4. Crystal Lake 2023 SI reports plotted by location (241 total reports).

Summary Conclusion: Both avian schistosome metrics (snail infection and SI case reports) in 2023 strongly suggest that the suspension of the MI-DNR Common Merganser Control Program has resulted in a significantly increase in the *Trichobilharzia stagnicolae* population on Crystal Lake.

Recommendations:

Based on the scientific data collected in 2022 and 2023, we strongly encourage the CLWA to lobby the MI-DNR to resume the MI-DNR Common Merganser Control program in 2024. These data, combined with the Congregational Summer Assembly's swimmer data since 2018, strongly suggest that trapping and relocating common merganser broods is a highly effective swimmer's itch control strategy on Crystal Lake (and other MI lakes).

We recommend the following action items for 2024:

1. The CLWA continue to assess/monitor swimmer's itch case reports on Crystal Lake (the CSA beach study does this well)
2. The CLWA fund a comprehensive snail infection level assessment in 2024.

This will put the CLWA in the best possible position for any future common merganser trapping/relocation permit renewals.