



Crystal Lake 2019 water samples

Report

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by

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and

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*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.



Summary of work completed:

On July 30, 2019 and September 18, 2019, water samples were collected from 10 sites on Crystal Lake by Crystal Lake personnel. The 10 sites in 2019 match the 10 sites used in 2018 (July 12-13) by Swimmer's Itch Solutions, LLC. The 2019 samples were shipped to Dr. Randall DeJong on Nov 7, 2019. In the lab, these samples were filtered onto membranes, which were sliced in half, with one half of the membrane then used for DNA extraction. The other half of the filter membrane was stored at -80°C for later analysis if so desired.

Quantitative PCR (qPCR) was then performed on the twenty samples using the pan-schistosome assay that has been used in the past. This assay detects and quantifies all schistosome DNA in the sample. Five negative controls were run to test for contamination. Following the pan-schistosome assay, all positive samples were subjected to species-specific assays for *Trichobilharzia stagnicola* (host is common merganser), *T. physellae* (common merganser and mallard), *Anserobilharzia brantae* (Canada goose), and *T. szidati* (mallard). Negative controls were included in these tests also.

Results:

Estimated numbers of cercariae for 2019 are displayed on the map below, and compared to the values in 2018 (Figure 1). The median number of cercariae in 2019 (1.6 cercariae in 25 liters) was slightly lower than 2018 (4.5 cercariae). The lower median in 2019 is due largely to more sites that were negative: whereas 0 of 10 sites were negative in 2018, 2 sites were negative in July 2019 and 5 sites were negative in September 2019. In 2019, there was one exceptionally high estimate (245) at Orchard Hill. All negative controls were negative, indicating that DNA contamination was not an issue.

qPCR analyses can also detect temporal "cercarial outbreaks" (i.e., sites that at a given point in time have parasite levels that can be considered severe). Such outbreaks occurred at the following sampling locations: Beulah Beach and M6 in 2018; CBCA, Beulah Beach and Nichols Rd in July 2019; and Nichols Rd and Orchard Hill in September 2019.

All 13 samples positive for the pan-schistosome assay were found to contain only *T. stagnicola* DNA when subjected to the species-specific assays, consistent with results in 2018. All samples were negative for the other species tested, so *T. stagnicola* remains the dominant species on Crystal Lake, as it does on most other lakes in northern Michigan. All negative controls were again negative.





SWIMMER'S ITCH SOLUTIONS

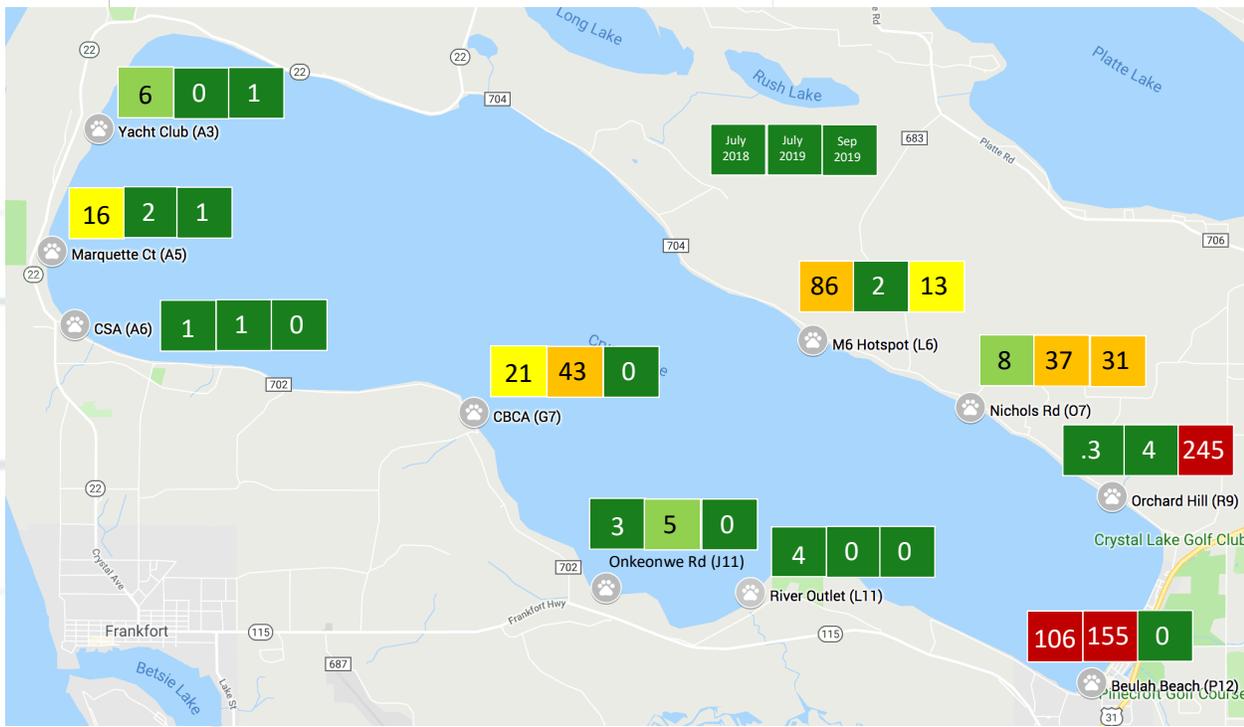


Figure 1. Estimated number of avian schistosomes per 25 mL water in samples taken from Crystal Lake (Benzie County, MI). Analyses were done with qPCR; data from different dates are displayed left to right at each site: left box = July 12-13, 2018, middle box = July 30, 2019, and right box = September 18, 2019. Data from 2018 are the average of 4 samples from the same location, while 2019 data are from single samples. All positive samples subjected to species-specific assays were identified as *T. stagnicola* and were negative for other species tested.

Recommendations:

- Continue common merganser trap and relocation program. The CSA swimmer data and anecdotal reports from many lake residents strongly suggest that the program is working. Since qPCR data were first taken in 2018 a year after the program had started, the estimated number of cercariae was already moderately low. The qPCR data do show modest reduction in 2019, but qPCR estimates can be easily influenced by environmental factors and infrequent sampling protocols.
- Continue water sampling program to allow for more comparison to previous two years. We recommend 20-40 samples for sample size.
- Consider assessing snail infection rates in 2020 with a collection of 2000 snails at the 10 sites (200 snails per site). This will make an excellent comparison to data from 2016 and 2018.