freshwater solutions
innovative swimmer's itch strategies

Battling Swimmer's Itch

Progress & Hope!

LLA Annual Meeting
Boone's Long Lake
18 August, 2018

The 2018 FWS Team

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FWS

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Basic biology…

University of Michigan Biological Station − circa 1990

Life Cycle Revealed *(Cort, 1928)*

Adult worms

Life Cycle Revealed *(Cort, 1928)*

Adult worms

Egg

Life Cycle Revealed *(Cort, 1928)*

Adult worms

Egg

Miracidium

Life Cycle Revealed *(Cort, 1928)*

Adult worms

Egg

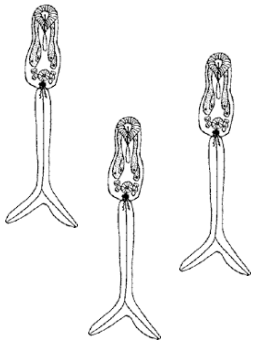
Miracidium

Sporocyst

Life Cycle Revealed *(Cort, 1928)*

Adult worms

Egg



Cercariae

Miracidium

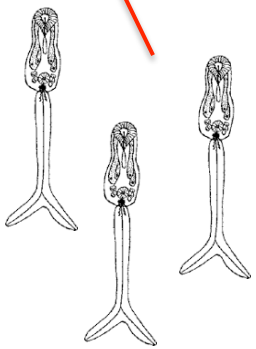
Sporocyst

One Common NW Michigan Scenario

Merganser host for adult worms

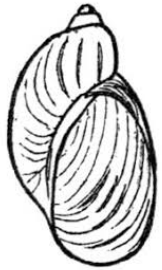
Accidental host

Egg



Cercariae

Miracidium



Stagnicola snail host for sporocyst

Lime Lake - 1988

Douglas Lake (UMBS) - 1990

Whole-lake SI Assessment

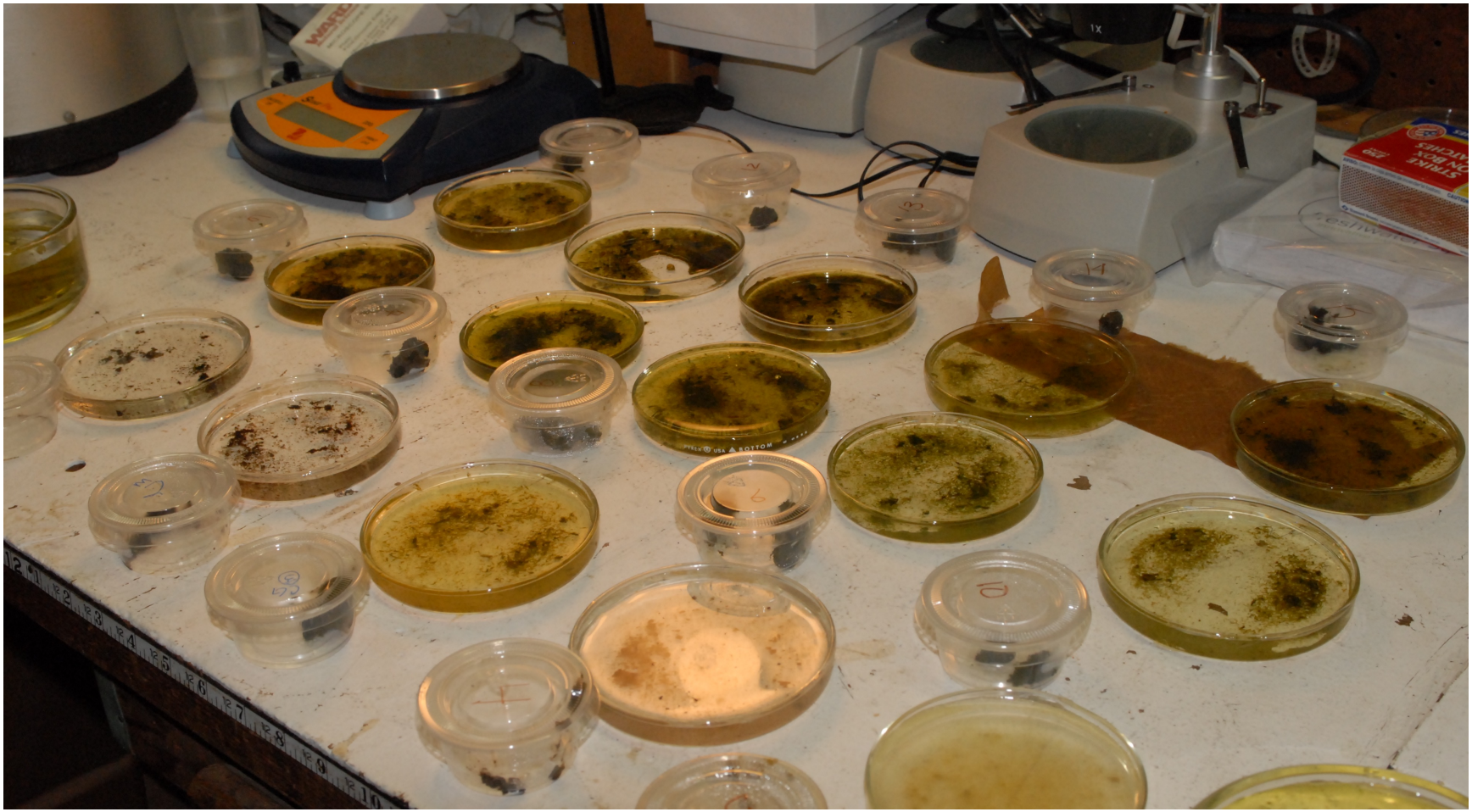
1. Resident waterfowl population profile

Whole-lake SI Assessment

2. Resident waterfowl infections

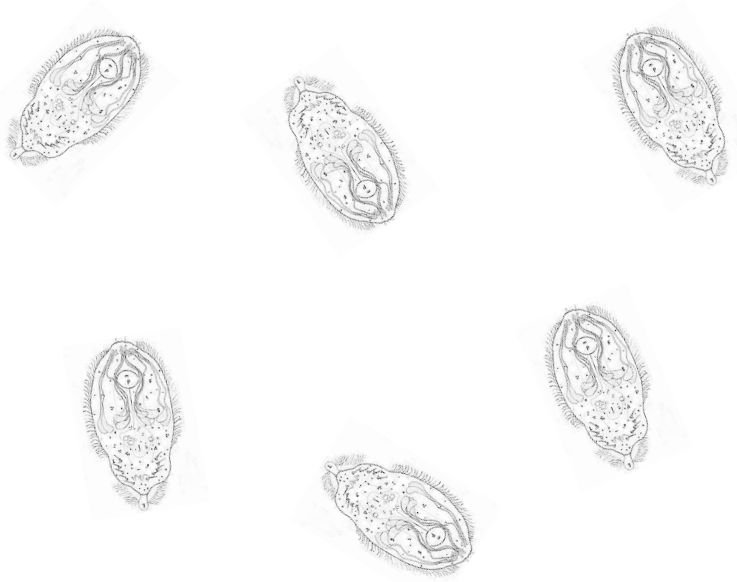
Gladys Kravitz…ABNER!!!

Caca à la eau!



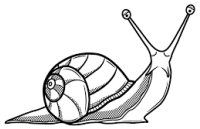
Whole-lake SI Assessment

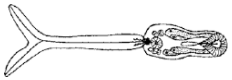
3. Miracidia DNA sequenced for species identification



Whole-lake SI Assessment

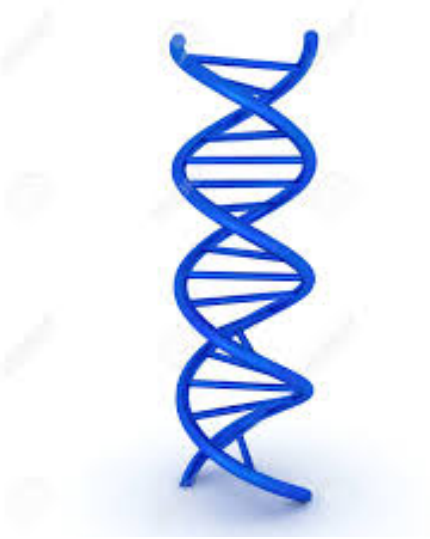
4. Snail population profile





Whole-lake SI Assessment

5. Snail infections coupled with cercariae DNA sequencing for species identification



Whole-lake SI Assessment

6. Cercariae levels in water samples measured using qPCR

Whole-lake SI Assessment

7. Reported SI cases

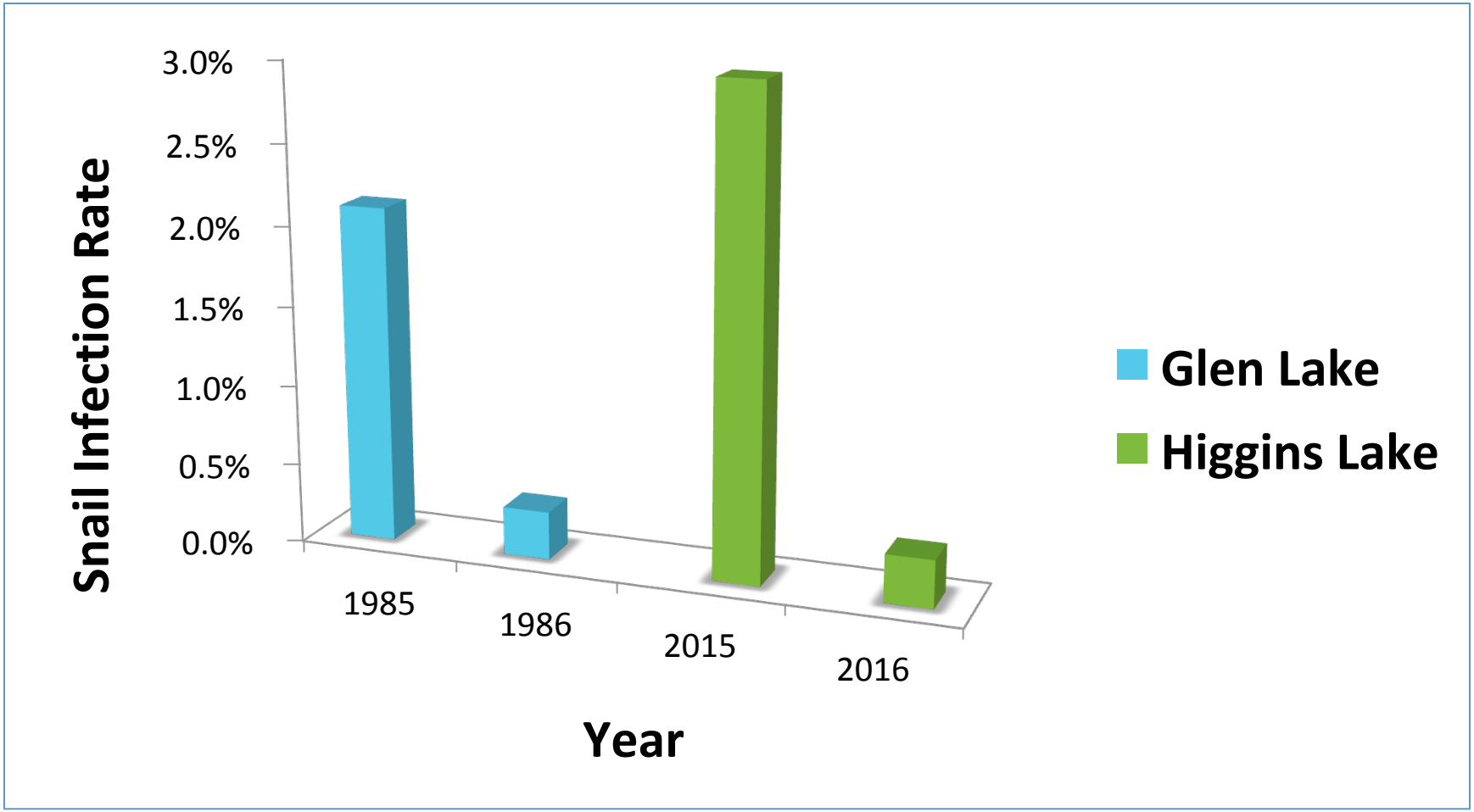
Long Lake "Sneak Preview"

- Waterfowl survey on 7/13:
  - 108 mallards (11 broods)
  - 11 Canada geese
  - 10 loons
  - 1 wounded hooded merganser*
- Poop samples from 5 HY mallards:
  - All positive for schistosomes
- Snail collections on 6/26 & 7/31 (6 locations):
  - *Gyraulus*, *Campeloma*, *Helisoma*, *Physa*, *Stagnicola*, *Maristonia*, *Pleurocera*
  - No *Stagnicola* positive with schistosomes (83)
- Water samples & qPCR analysis:
  - There are "worms in the water" (duh)
  - Moderate levels when compared to other NW Michigan lakes in 2018

Recent Progress

Research Leading to Education & Control

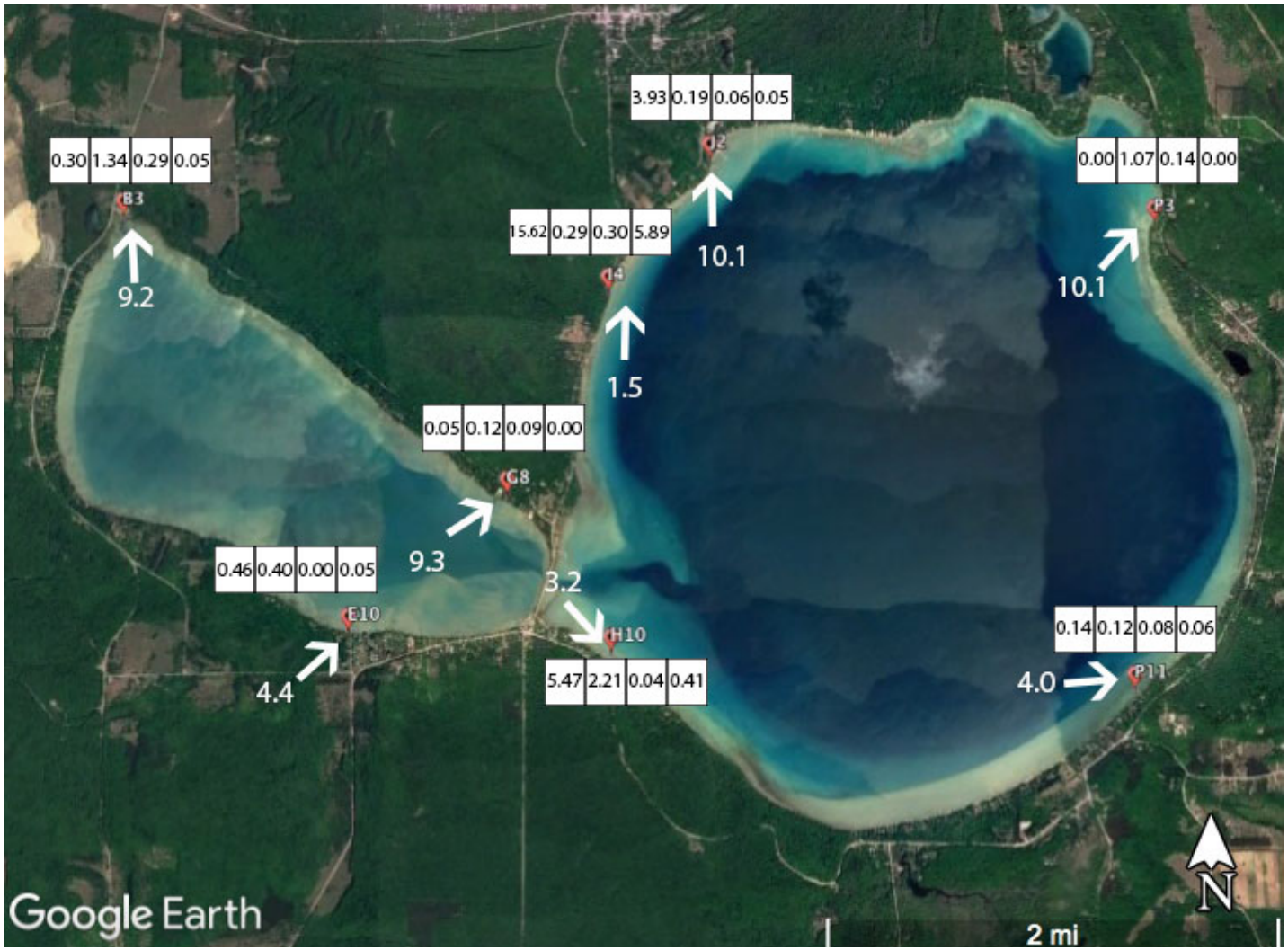
Control of *T. stagnicolae* by merganser brood removal

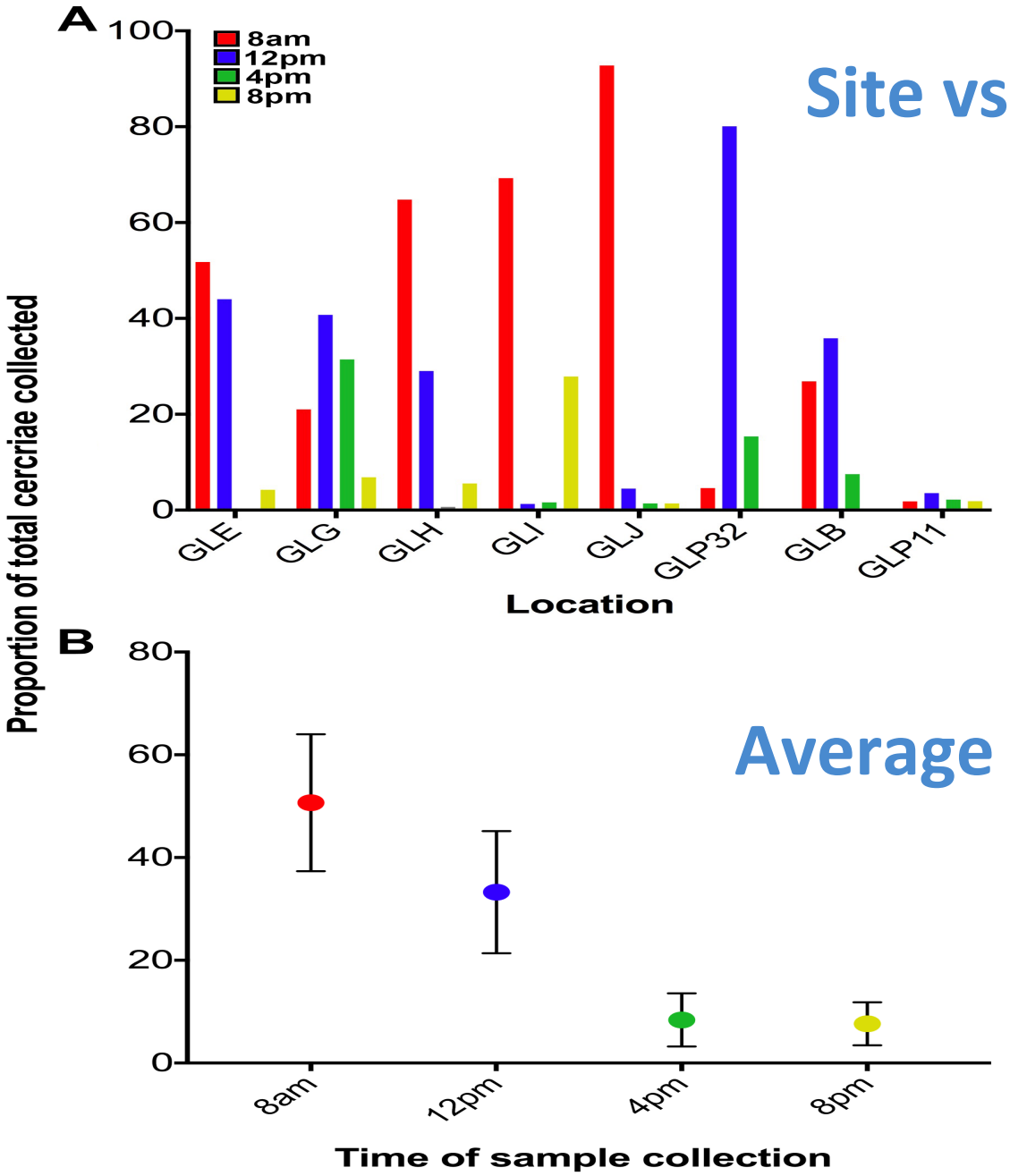


Time of Day Discovery

vs.

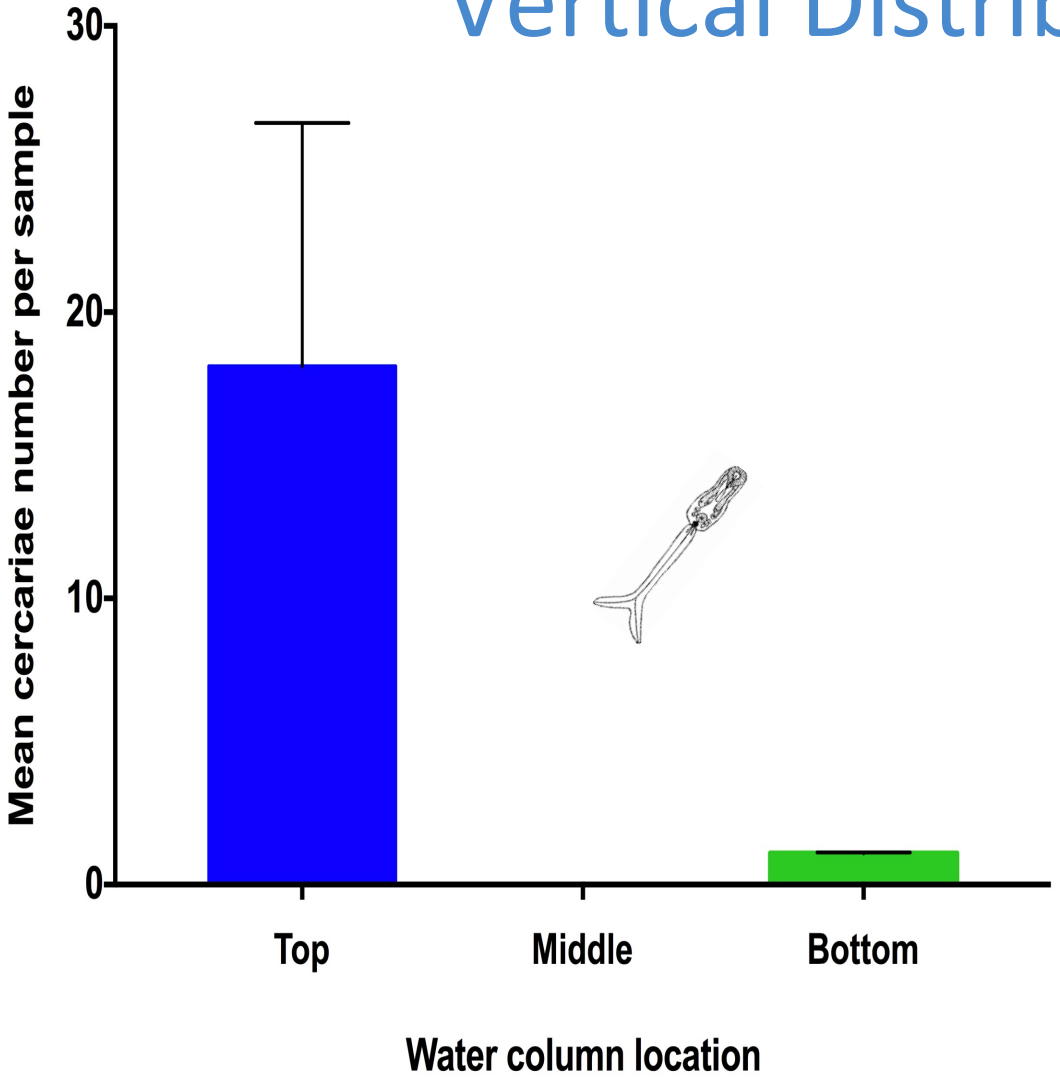
Big and Little Glen Lake



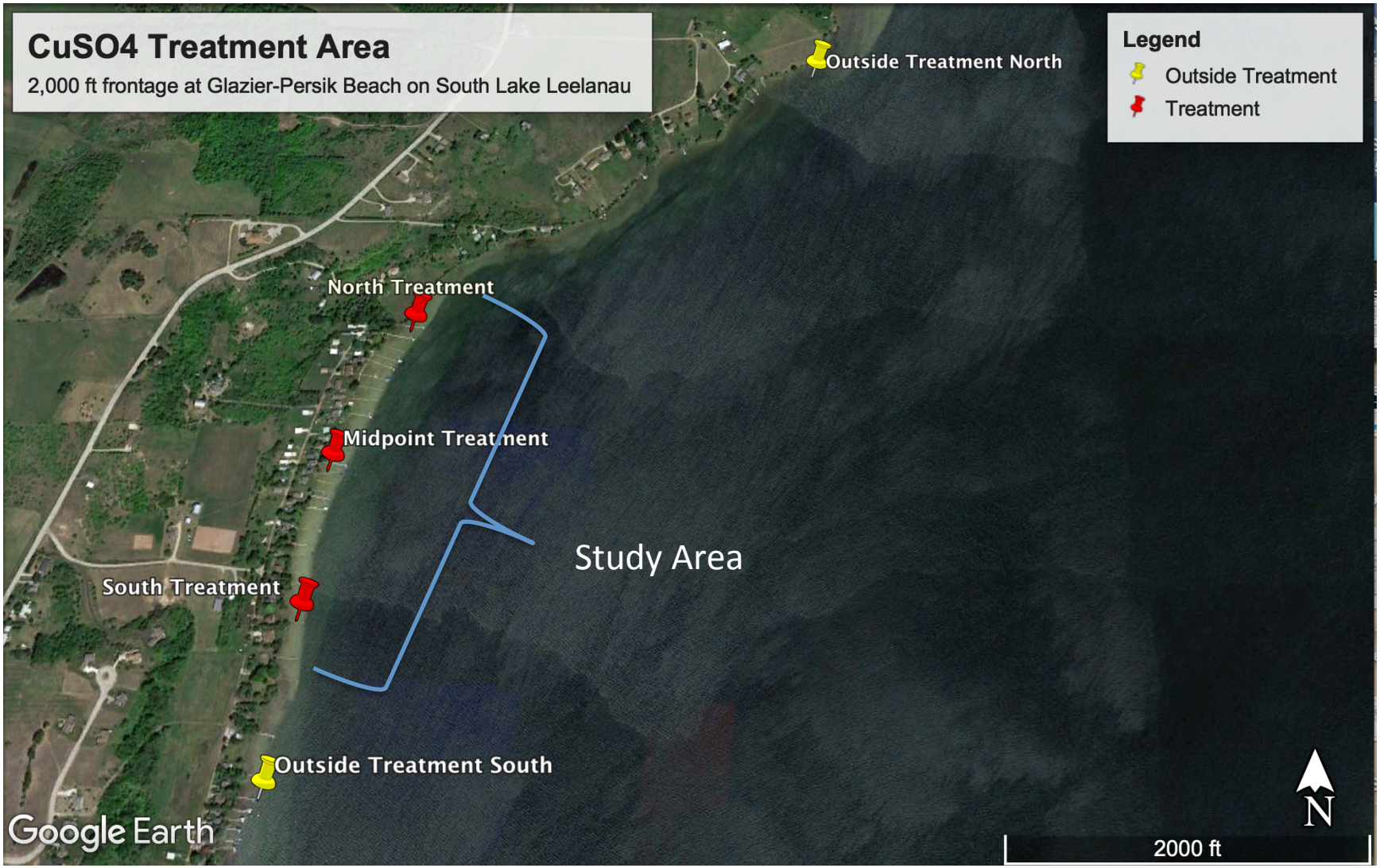

A
8am
12pm
4pm
8pm
Site vs. Time
Proportion of total cercriae collected
100
80
60
40
20
0
GLE
GLG
GLH
GLI
GLJ
GLP32
GLB
GLP11
Location
B
Average vs. Time
80
60
40
20
0
8am
12pm
4pm
8pm
Time of sample collection

Cercariae Distribution Affirmation

Vertical Distribution

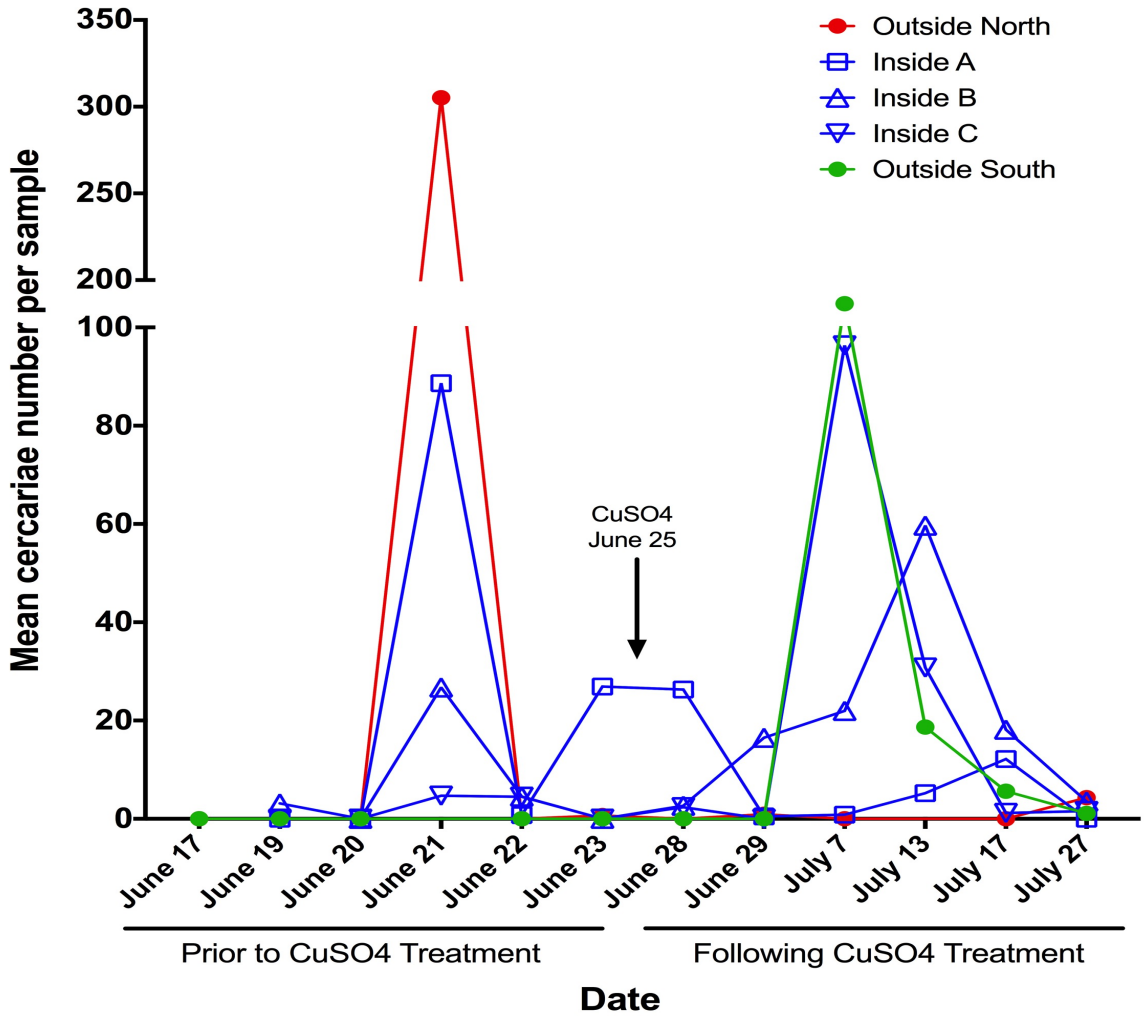


Efficacy of $CuSO_4$ for SI Control



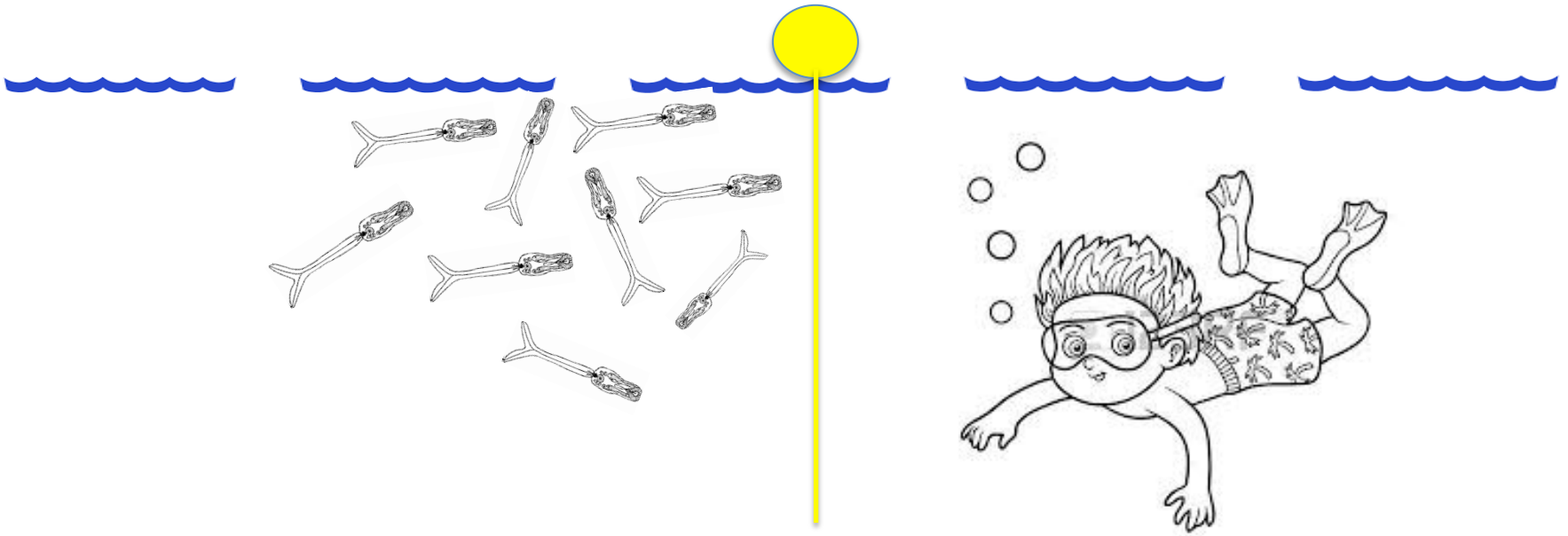
Pre & Post $CuSO_4$ Treatment

qPCR Water Sample Analysis



Safer Swim Areas

Conceptually: Remove Snails



Outside **Inside**

Experimental Baffle

North Lake Leelanau

Experimental Baffle

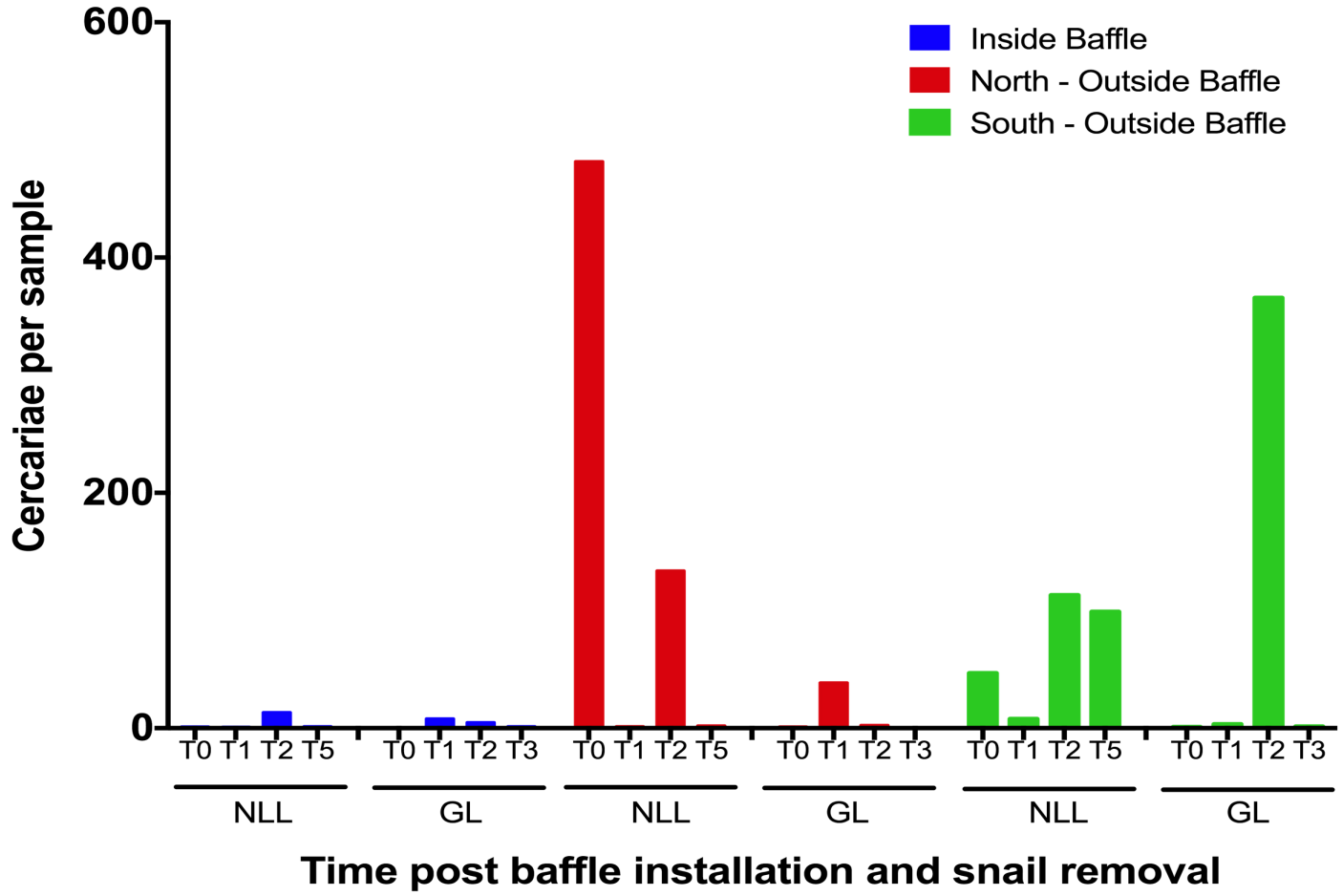
Glen Lake

Removing snails inside baffle

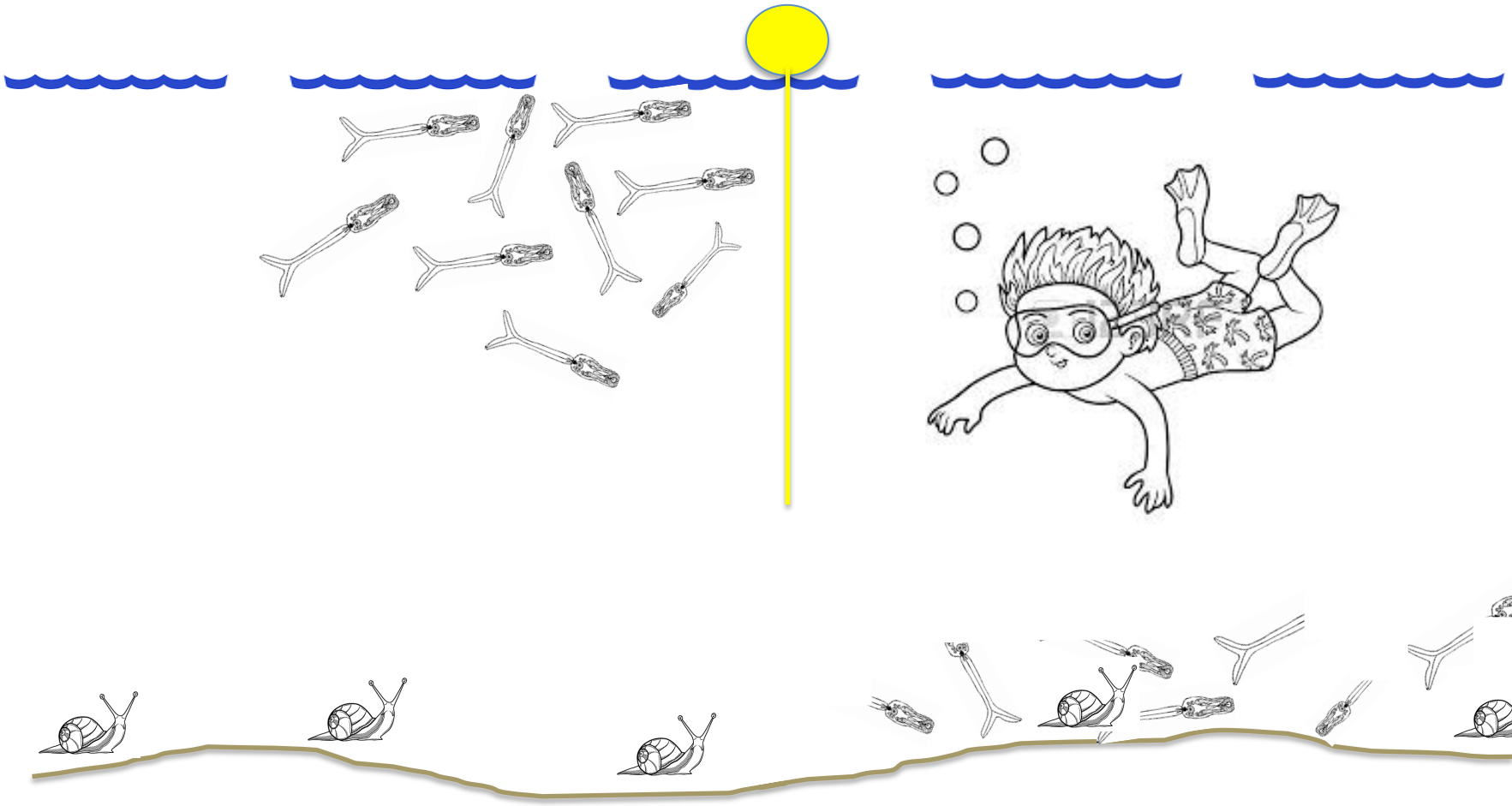
827 *Stagnicola* Snails (< 1 hr)

Glen Lake Site

Cercariae counts inside and outside after snail removal

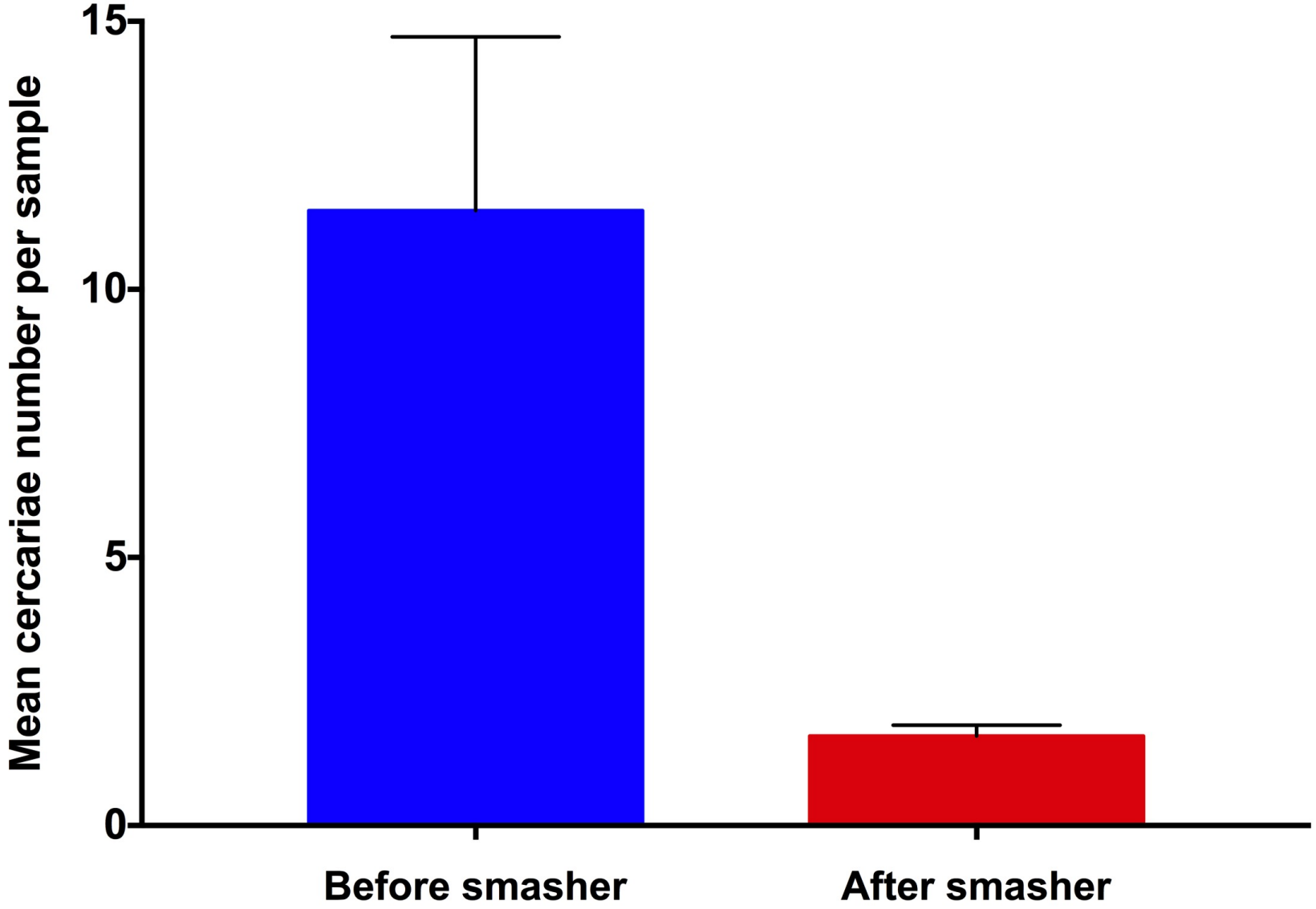


Conceptually: Leave snails, destroy cercariae



The “Smasher”!

“Smasher” Results (after 30 min.)



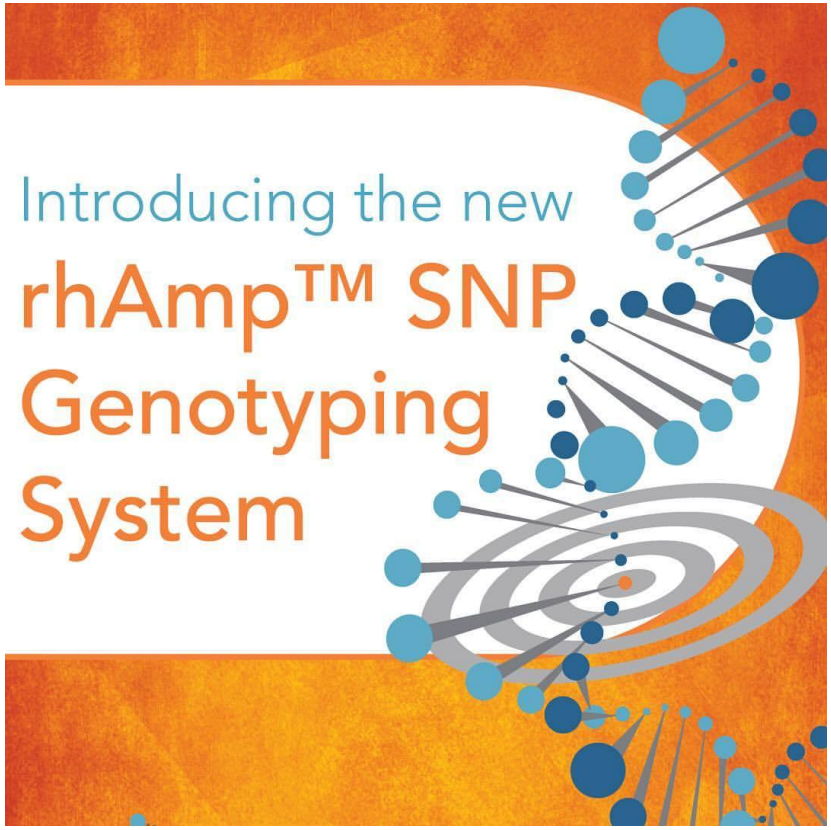
Validating, reducing costs, improving effectiveness of safer swim areas in 2018

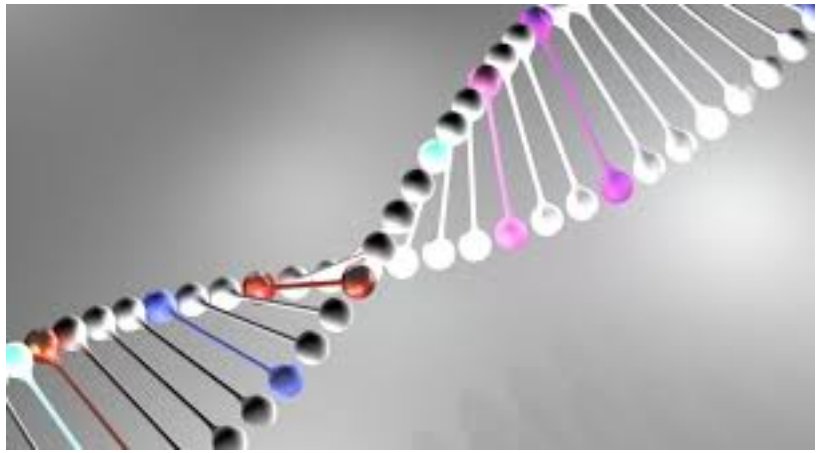
Publishing

- *"Use of qPCR-based cercariometry to assess swimmer's itch in recreational lakes"* **Published in EcoHealth, 17 August 2018**
- "Evaluating the efficacy of molluscicide copper sulfate (CuSO4) at reducing cercariae concentrations at a recreation site in Michigan" **preparing for submission**

qPCR Refinement

– rhAmp SNP (“ramp-snip”) Genotyping Technology





Answering More Questions About Swimmer's Itch

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Does “stirring up the bottom” increase risk?

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How far can wind blow cercariae?

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Does “stirring up the bottom” increase risk?

How far can wind blow cercariae?

Does risk decrease with distance from shore?

Answering More Questions

Does “stirring up the bottom” increase risk?

How far can wind blow cercariae?

Does risk decrease with distance from shore?

Is there risk when swimming in a river?

Advancing qPCR Metrics

Core Machine
University of Alberta

380+ Samples

Mobile Unit
Freshwater Solutions

16 Samples

Handheld Unit
Biomeme

3-9 Samples

freshwater solutions

innovative swimmer's itch strategies

Thank You!